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OF  
WELWITSCH'S  
AFRICAN PLANTS.  
VOL. II.—PART II.

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WELWITSCH'S  
AFRICAN PLANTS.



CATALOGUE  
OF THE  
AFRICAN PLANTS  
COLLECTED BY  
DR. FRIEDRICH WELWITSCH  
IN 1853-61.

VOLUME II. PART II.  
CRYPTOGAMIA.

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# VASCULAR CRYPTOGRAMS.

BY WILLIAM CARRUTHERS, F.R.S.

## SALVINIACEÆ.

**AZOLLA** Lam. Encycl. Meth., Bot. i. p. 343 (1783).

**A. pinnata** R. Br., Prodr. p. 167 (1810).

PUNGO ANDONGO.—Not infrequent in most rivers between Pungo Andongo and Cassange. The frond is whitish green, and then turns to rose-purple. It is found with *Nymphaea*, *Ceratophyllum* and *Pistia*. March 1857. No. 38.

LIBONGO.—Very abundant, both on the earth and in the water, in the shallow lake at Banza de Libongo, near the left bank of the Lifune with *Hydrocotyle*, *Juncaceæ*, etc. Sept. 1858. No. 37.

## MARSILEACEÆ.

**MARSILEA** Linn. Gen. Pl. p. 326 (1737).

1. **M. cornuta** A. Br. in Monatsb. K. Akad. Wissensch. Berlin 1870, p. 728.

*M. diffusa* var. *cornuta* A. Br. in Kuhn, Fil. Afr. p. 199 (1868). *M. diffusa* var. Baker, Fern Allies p. 141 (1887).

MOSSAMEDES.—Common in shallow pools near the banks of the Bero, near Capondo and Cavalheiros. At the end of June 1859. No. 173. Frequent, in association with *Pistia* in lakes near the mouth of the river Giraúl or Maiombo. Without fruit, 18 and 19 July 1859. No. 174.

2. **M. rotundata** A. Br. in Kuhn, Fil. Afr. p. 200 (1868).

GOLUNGO ALTO.—Somewhat rare in the rivulet Muchau or Mongola near Quilombo, in wooded places : 17 Sept. 1854. No. 40.

PUNGO ANDONGO.—On the margins of marshes between Lombe and Quibinda. Without fruit : March 1857. No. 39.

HUILLA.—In pools near the river Mumpulla in association with *Ottelia*. In fr. June 1860. No. 171. In wet ground between the Serra de Xella and Mumpulla along with *Trifolium*, *Juncus* and *Xyris*. Oct. 1859. No. 172.

3. **M. muscoides** Lepr. ex A. Braun in Flora xxii. p. 300 (1839).

LOANDA.—In moist clayey mud, even spreading into neglected cultivated places, near Loanda, Bemposta, towards Camama ; in fr. 18 May 1859. No. 109.

BENGUELLA.—In moist sandy muds, inundated in summer, on the shore between the city of Benguella and S. Ferrão dos Bimbos ; in fr. June 1859. No. 175.

## SELAGINELLACEÆ.

1. **STACHYGYNANDRUM** Pal.-Beauv. *Ætheog.* p. 105 (1805).*Selaginella* sp. Auct.1. **S. Welwitschii.***Selaginella Welwitschii* Baker, *Fern Allies*, p. 39 (1887).

PUNGO ANDONGO.—On the sunny, gneissose rocks on the tops of the mountains of Pungo Andongo—Pedra Cazella ; Oct. 1856. No. 43.

2. **S. depressum.***Selaginella depressa* A. Br. in *Ind. Sem. H. Berol.* 1859, p. 21.Var.  $\beta$ , **minus** A. Br. in Kuhn, *Fil. Afr.* p. 211 (1868) (*minor*).

PUNGO ANDONGO.—Frequent in hollows and by the shaded sides of the rivulets (very rare on sun-exposed rocks) to the west of Pedra de Cazella ; Dec. 1856. No. 44.

3. **S. versicolor.***Selaginella versicolor* Spring, *Lycopodiæ*. ii. p. 124 (1848).

PUNGO ANDONGO.—In hollows on the mountains of Serra de Pedras de Guinga ; Jan. 1857. No. 41.

GOLUNGO ALTO.—Somewhat rare at the cataracts of the lower rivulets of Capopa : Jan. 1856. No. 42.

4. **S. scandens** Pal.-Beauv. *Ætheog.* p. 106 (1805).

SIERRA LEONE.—On humid ground in shaded places on the mountains above Freetown ; Sept. 1853. No. 2.

CONGO.—In the humid woods on the banks of the Zaire or Congo. No. 27.

5. **S. tenerimum.***Selaginella tenerima* A. Br. in Kuhn, *Fil. Afr.* p. 193 (1868).

GOLUNGO ALTO.—Very rare on the mountains at 2400 ft. in Serra do Alto Queta, beside streams ; at the end of April 1856. No. 45.

6. **S. subcordatum.***Selaginella subcordata* A. Br. in Kuhn, *Fil. Afr.* p. 193 (1868).

SIERRA LEONE.—Among mosses on shaded rocks on the mountains above Freetown ; Sept. 1853. No. 3.

7. **S. rubricaulis.***Selaginella rubricaulis* A. Br. in McNab, *Trans. Bot. Soc. Edin.* ix. p. 11 (1867).Var.  $\beta$ , **angolense** A. Br. in Kuhn, *Fil. Afr.* p. 212 (1868) (*angolensis*).

PRINCE'S ISLAND.—In very shaded woods on Mount Pico de Papagaio, 2500 to 2300 ft. Sept. 1853. No. 11.

GOLUNGO ALTO.—On the banks of rivulets in the woods of Alta Queta near Cazengue ; in fr. July 1856. No. 40. Not infrequent among mosses in densely shaded places on the banks of Rio de Capopa ; in fr. Nov. 1855. No. 47.

2. **SELAGINELLA** Pal.-Beauv. *Ætheog.* p. 101 (1805).**S. rupestris** Spring, in *Mart. Fl. Brasil.* I. ii. p. 118 (1840).Var.  $\beta$ , **incurva**, *forma angolensis* A. Br. in Kuhn, *Fil. Afr.* p. 213 (1868).

HUILLA.—Frequent on rocks covered with brushwood not far from the cataracts of Ferrão da Sola in Sobato Lopollo, with *Gleichenia polypodioides*. Without fr. Dec. 1859; with fr. April 1860. No. 169.

Var.  $\gamma$ , **recurva**, forma *Welwitschiana* A. Br. in Kuhn, Fil. Afr. p. 213 (1868).

PUNGO ANDONGO.—Frequent in rocky places, Pedras de Guinga: March 1857. No. 48. Frequent on the highest rocks of the mountains of Pedras negras of Pungo; Feb. 1857. No. 49.

### 3. ISOETES Linn. Sp. Pl. ed. v. p. 486 (1754).

#### 1. I. *Welwitschii* A. Br. in Kuhn, Fil. Afr. p. 196 (1868)

HUILLA.—In pastures with *Xuris*, *Ophioglossum*, and *Antrolepis*, or in turfey places with *Eriocaulon*, *Utricularia*, and *Drosera*, in the plain called Empalanea: in fr. April 1860. No. 166.

#### 2. I. *æquinoctialis* Welw. ex A. Br. in Kuhn, l.c., p. 195 (1868).

PUNGO ANDONGO.—Not infrequent in sandy, moist, wooded pastures with *Drosera*, *Biophytum*, *Cyperaceæ*, etc., between Pungo Andongo and Sansamanda; 6 Feb. 1857. No. 50.

## LYCOPODIACEÆ.

### LYCOPODIUM Linn. Gen. Pl. p. 313 (1737).

#### 1. L. *cernuum* Linn. Sp. Pl. p. 1103 (1753).

PRINCE'S ISLAND.—In the primeval woods of Pico de Papagaio at 3000 ft.; Sept. 1853. No. 10.

#### FERNANDO PO.—No. 20.

HUILLA.—By the margins of rivulets on the mountains of Lopollo, in company with species of *Melastomaceæ*, *Ericaceæ*, and *Cyatheeæ*, at a height of 5000 ft.; in fr. May 1860. No. 170.

#### 2. L. *sarcocaulon* Br. & Welw. in Kuhn, Fil. Afr. p. 210 (1868).

HUILLA.—In spongy marshes with *Drosera* and *Utricularia*, Morro de Lopollo. Rarely fruiting. April 1860. Nos. 167, 168.

## FILICES.

### 1. GLEICHENIA J. E. Smith, in Mem. Acad. Turin. v. p. 419 (1793).

#### 1. G. *polypodioides* J. E. Sm., l.c., t. 4, f. 10; Hk. & Bak. Syn. Fil. p. 11.

HUILLA.—At the cataract of Ferrão da Sola, the long creeping stem among the plants of *Selaginella rupestris* Spring; April 1860. No. 162.

#### 2. G. *Hermannii* R. Br. Prod. Flor. N. Holland. p. 164 (1810).

*Polypodium dichotomum* Thunb. Fl. Jap. p. 338, t. 37 (1784); *Merteusia dichotoma* Swartz Syn. Fil. p. 163 (1806); *Gleichenia dichotoma* Hk. Sp. Fil. i. p. 13 (1846).

A frutescent fern, with the stem at first 3 to 5 ft. high, and suberect, then dichotomously dividing, and climbing high and wide, 12 to 15 ft. and more high.

GOLUNGO ALTO.—Somewhat rare and sporadic on the slopes of Quilombo Quiacatubia towards the river Zenza; Feb. 1855. No. 72.

PRINCE'S ISLAND.—Not infrequent in the mountains called Pico de Papagaio; Sept. 1853. No. 19.

2. **CYATHEA** J. E. Smith in Mem. Acad. Turin. v. p. 419 (1793).

1. **C. Welwitschii** Hk. Syn. Fil. p. 21 (1868).

ST. THOMAS.—In the natural woods of Monte Caffé; in fr. Dec. 1860. No. 66.

2. **C. Angolensis** Welw. Apont. in Ann. Cons. Ultram. 1858, p. 538; Hk. & Bak. Syn. Fil. p. 22.

PUNGO ANDONGO.—Not infrequent on the humid high rocks of the præsidium near the brooks, as Funda Quilombo, Catete, etc., not seen beyond the limits of the præsidium. Growing with *Musa ventricosa*. In fr. November and December 1856. Fronds with fully mature fructification, Barrancos de Catete; May 1857. No. 83.

HUILLA.—Very frequent near the banks of the streams in the higher regions of Morro de Lopollo. In fr. Jan. 1860. No. 186.

3. **ALSOGRAPHIA** R. Br. Prod. Flor. N. Holland. p. 158 (1810).

1. **A. aethiopica** Welw. in Hk. & Bak. Syn. Fil. p. 44 (1868).

GOLUNGO ALTO.—In shady places in the natural wood on the northern side of Alto Queta. In fr. at the beginning of June 1855. No. 116. Somewhat rare in the woods of Quisucula, Bango. Fruiting August 1857. No. 116. In the natural woods of Mata de Quisucula; July 1857. No. 128

4. **TRICHOMANES** Linn. Gen. Pl. Ed. ii. p. 504 (1742).

1. **T. pyxidiferum** Linn. Sp. Pl. p. 1098 (1753).

GOLUNGO ALTO.—Along with *Polypodium irioides*, on moss-covered trunks in the primitive forests, at Mata di Quisucula, near Bango Aquitamba. In fr. Aug. 1857. No. 73.

2. **T. radicans** Sw. Flor. Ind. Occid. iii. p. 1736 (1806).

GOLUNGO ALTO.—On moist banks near the streams on the high shady places of Mata de Quisucula. Without fr. 28 April 1856. No. 74.

3. **T. rigidum** Sw. Flor. Ind. Occid. iii. p. 1738 (1806).

GOLUNGO ALTO.—On the shady rocks of the mountains of Serra de Alto Queta, above Sange. Without fr. 27 May 1855; with fr. end of June 1855. No. 75

The imperfect fragment (No. 2042) in the British Museum is indeterminable. Dr. Welwitsch found it intermixed with *Selaginella rubricaulis* (No. 47) when he was working with his herbarium in London. The specimens were found near Capopa, Golungo Alto.

5. **DAVALLIA** J. E. Sm. in Mem. Acad. Turin. v. p. 414 (1793).

1. **D. nitidula** Kze. in Linnaea x. p. 545 (1836).

GOLUNGO ALTO.—Frequent on living trunks of trees, especially of palms (*Elaeis* and *Raphia*) in the dense woods of Serra de Alto Queta. In fr. Jan. 1855. No. 146. On trees in the damp woods near Sange; Dec. 1854. No. 146b.

2. **D. Vogelii** Hook. Sp. Fil. i. p. 168 (1846).

ST. THOMAS.—On the old stems of palms (*Elaeis*), in the humid

woods at about 1500 to 2000 ft. In fr. Dec. 1880. No. 56. Baker (Syn. Fil.), and Mettenius in Kuhn, Fil. Afr. p. 158, have referred this species to *D. elegans* Sw. (*D. denticulata* Mett.). If the spurious venules so characteristic of *D. elegans* are of any value for determining species, this plant cannot be included in that species.

3. *D. flaccida* R. Br. Prod. Fl. N. Holl. p. 157 (1810).

*D. polypodioides* Sw. Adnot. p. 69 (1829). *D. Spelunca* Baker Syn. Fil. p. 100 (1868).

ST. THOMAS.—In the margins of the woods near Monte Caffé, frequent up to 2560 ft., but seldom in fruit. A very beautiful fern 4-6 ft. and taller, with a stout stipes and hairy spreading pinnae; Dec. 1860. No. 56.

GOLUNGO ALTO.—On the banks of the river Delamboa, near Tange, 4 to 6 and even 8 ft. high; in good fr. Sept. 1856. No. 124b. In dense primitive woods at Sobato de Quilombo, near the rivulets, and not far from the *Adansonia* on which *Rhipsalis* was found. In fr. Jan. 1855. No. 126.

Two young plants from this district are found in Welwitsch's Herb.; the one, No. 124, was found in the primitive woods by the river Delamboa, near Sange, July 1856; and the other, No. 125, appeared in his garden at Golungo, a seedling the spores of which were brought with plants from Sobato de Bumba. These both belong to this species.

PUNGO ANDONGO.—In shady places at Pedra de Cabondo; Dec. 1856. No. 127.

4. *D. thecifera* H.B.K. Nov. Gen. Sp. Pl. i. p. 23 (1815).

*Asplenium theciferum* Mett. Ann. Sc. Nat. Ser. v. vol. ii. p. 227 (1843). *D. Lindenii* Hk. Sp. Fil. I. p. 193 (1846).

PUNGO ANDONGO.—On wet shady rocks in Barrancas de Catete near the prasidium. In fr. Dec. 1856. No. 77.

This cannot be distinguished from the South American species to which Mettenius referred it. *D. concinna* Schrad. from South Africa has the pinnae decreasing downwards as well as upwards, while the fronds of *D. thecifera* H.B.K. are sub-deltoid, with the pinnae largest at the base. *D. Schimperi* Hk. is a synonym of *D. concinna* Schrad. There are specimens of *D. thecifera* H.B.K. in Herb. Mus. Brit., from Madagascar collected by the Rev. Deans Cowan, and from Equatorial Africa, east of Kirilandusi, 6100 ft., collected by Dr. J. W. Gregory.

6. **ADIANTUM** Linn. Gen. Pl. p. 322 (1737).

1. *A. lunulatum* Burm. Fl. Ind. p. 235 (1768); Hk. & Bak. Syn. Fil. p. 114.

SIERRA LEONE.—In woods at the base of Sugarloaf Mountain behind Freetown; Sept. 1853. No. 5.

GOLUNGO ALTO.—Not abundant on the banks of the Calolo, among the mountains of Mongollo; Sept. 1854. No. 149c.

2. *A. Mettenii* Kuhn, Fil. Afric. p. 64 (1868).

*A. pteropus* R. Br. in Herb. Mus. Britt.

GOLUNGO ALTO.—Sparsely in shaded places at the rocky springs of Capopa, near Canguerasange; 1 Dec. 1854. No. 150. On the shaded sides of the road between Cacarambolo and N-dele, frequent, but rarely fruiting; Aug. 1855. No. 150b. In shady woods in the

mountains of Queta, by the side of torrents but not frequent; Oct. 1854, Aug. 1855. No. 150.

Welwitsch distinguished this as a species, and gave it a name in his Herb. It had been raised to this rank by R. Brown, from specimens collected in the Congo region by Chr. Smith, and his herbarium name *A. pteropus* has been quoted in books. The striking character which suggested Brown's name is the broad wing on the short stalk of the pinnæ, which also passes down the rachis.

3. **A. Zollingeri** Mett. teste J. E. Bommer.

PUNGO ANDONGO.—On schistose rocks near M-popo, not far from the banks of the river Cuanza. In fr. April 1857. No. 149. In a single place, but there abundant on shaded moist rocks near Rio Mangue; 31 Jan. 1857. No. 149b.

4. **A. Capillus Veneris** Linn. Sp. Pl. p. 1096 (1753); Hk. & Bak. Syn. Fil. p. 123.

CAPE DE VERDE ISLANDS.—Frequent in humid places in the interior of the Isle of St. James; in fruit Jan. 1861. No. 71.

GOLUNGO ALTO.—Common at springs, on humid banks, etc. Growing all the year round. At cataracts of the river Cuango; Aug. 1855. No. 151.

BUMBO.—Frequent on river banks in shady places of the Serra da Xella; in fr. Oct. 1859. No. 200.

7. **LONCHITIS** Linn. Gen. Pl. p. 522 (1737).

1. **L. occidentalis** Baker, Syn. Fil. p. 128 (1867).

*L. glabra* Hk. f. (non Bory), Journ. Linn. Soc. vii. p. 234. *L. glaberrima* Mett. in Kuhn, Fil. Afr. p. 81. (1868).

GOLUNGO ALTO.—4 to 8 ft. high, generally 5 ft. In the woods, chiefly near the rivers of Sobati de Quilombo, 2500 to 2800 ft. high; in fr. July 1856. No. 132a. Woods of Mata de Quisucula, Sobati de Bango Aquitamba; 29 April 1856. No. 132b.

Welwitsch observes that as the sori are not limited to the sinus, but extend up the margins, even to the apex of the lobes, this species exhibits a transition from *Lonchitis* to *Pteris*.

8. **CHEILANTHES** Swartz, Syn. Fil. p. 5, 126 (1806).

1. **C. Kirkii** Hk. Second Cent. Ferns, tab. lxxxi. (1861).

GOLUNGO ALTO.—Very rare on the mossy banks of the cataracts near Pedra Cabondo; in fr. Nov. 1856. No. 142. In the shady margins of the road from Sange to the source of the Capopa, 2000 ft.; Dec. 1856. No. 143.

HUILLA.—On shaded rocks near the cataract of Ferrão de Sola near Lopollo.

This is *Pellaea geranifolia* Féé with the rounded distinct indusia of *Cheilanthes*. Welwitsch says that a true indusium is present, which appears not to be formed from the edge of the frond; this would transfer it to the genus *Pteris*, where Kuhn places it, but it is, in my judgment, a true *Cheilanthes*.

2. **C. hirta** Sw. Syn. Fil. p. 128 (1806).

HUILLA.—On wooded banks near the stream that flows from Morro de Lopollo; Nov. 1859. No. 202.

3. **C. Welwitschii** Hook. in Hk. & Bak. Syn. Fil. p. 142 (1868); non *C. lutea* Moore, Ind. Fil. p. 246.

HUILLA.—In the mountains of Morro de Monino between the river Monino and the great lake of Ivantida, 5600 ft. : in fr. Feb. 1860. No. 198.

PUNGO ANDONGO.—Frequent at the source of the Cazamba towards Catete : Dec. 1856. No. 148.

4. *C. farinosa* Kaulf. Enum. Fil. p. 212 (1824); Hk. & Bak. Syn. Fil. p. 142.

HUILLA.—In the mountains of Morro de Monino : in fr. Apr. 1860. No. 201.

9. **PELLÆA** Link, Fil. Sp. Hort. Berol. p. 59 (1841).

1. *P. pectiniformis* Baker, Syn. Fil. Ed. 2, p. 147 (1874).

HUILLA.—Not frequent in the marshy banks of the streams. On the mountains of Serra de Oiahoia, near Humpata, 5000 to 5500 ft. high : in fr. May 1860. No. 191.

2. *P. Doniana* Hook. Sp. Fil. ii. p. 137 (1858).

PUNGO ANDONGO.—Not frequent among stones and short grass of the præsidium : April 1857. No. 135.

GOLUNGO ALTO.—Rare at the margins of forests above the sources of the Capopa, Sobati de Bumba, July 1855. No. 136. In the rainy season this fern is intensely glaucous green, in the dry season the pinnae become contracted and involute, and look as if they were linear.

3. *P. hastata* Link, Fil. Sp. Hort. Ber. p. 60 (1841); Hk. & Bak. Syn. Fil. p. 152.

*Pteris viridis* Forsk. Fl. Egypt.-Arab. p. 186 (1775).

HUILLA.—On dry and moist rocks between Humpata and Lopollo, Jan., with fr. April 1860. Nos. 183, 183<sup>b</sup>, 183<sup>c</sup>.

A small plant from the same locality growing among *P. hastata* and *P. calomelanos* (No. 183<sup>d</sup>) possesses characters common to the two plants which led Dr. Welwitsch to question the value of the species. This plant has the habit of *P. hastata* Link., but the segments are scarcely suberinate, the rachis is not winged, and the veins in the segments are inconspicuous as in *L. calomelanos* Link. Welwitsch suggests that it may be the plant named *Pteris leucomelas* Mett. in Kuhn, Fil. Afr. p. 83.

4. *P. calomelanos* Link, Fil. Sp. Hort. Ber. p. 61 (1841); Hk. & Bak. Syn. Fil. p. 152.

HUILLA.—In rocky woods near Mumpulla but sparsely. Serra Oiahoia at its base : Oct. 1859. No. 181. In damp rocky places between Lopollo and Nene towards Empalanea : Feb., in fr. May 1860. No. 182.

5. *P. dura* Hk. Sp. Fil. ii. p. 139, tab. exiii. (1858).

*P. Burkeana* Baker, Syn. Fil. p. 153 (1868).

HUILLA.—On scattered rocks in woody places between Lopollo and Nene. In fr. April 1860. No. 178.

10. **PTERIS** Linn. Gen. Pl. p. 322 (1737).

1. *P. longifolia* Linn. Sp. Pl. p. 1074 (1753).

GOLUNGO ALTO.—At the cataracts on the river Cuango ; Dec. 1854. Frequent by the margins of the rivulets of Cuango and Aniopozo, near

Sange, 2000 to 2500 ft.; rare in the rest of Angola. In fr. May to July 1855 and 1856. No. 133.

BUMBO.—By rivulets in the shady primitive woods of the Serra da Xella; Oct. 1859. No. 204.

2. **P. cretica** Linn. *Mantissa*, p. 130 (1767).

BUMBO.—In shady places beside rivulets in the Serra da Xella between Chaô da Xella and Arruial do Caionda, not common except in one locality, Oct. 1859. No. 179

3. **P. quadriaurita** Retz. *Obs. Bot. Fase.* vi. p. 38 (1791).

ST. THOMAS.—In shady humid wood, on rocks about 1200 ft., frequent but not in fruit. Dec. 1860. No. 54.

GOLUNGO ALTO.—In the drier woods of Alta Queta: May 1855. Aug. 1855. No. 137. At the falls of Capopo, Sobado de Bumba; young plants Aug. 1855. No. 137a. In rabbit burrows in the forest of Mussengue, June 1856. No. 137d. In humid shady palm forests on the right side of the river Cnango; in fr. July 1855. No. 138. 3 to 4 ft. high.

4. **P. flabellata** Thunb. *Prod. Pl. Cap.* p. 172 (1800).

HUILLA.—Not infrequent in marshy woods between Lopollo and Humpata; March and April 1860. No. 177.

5. **P. aquilina** Linn. *Sp. Pl.* p. 1075 (1753).

ST. THOMAS.—Frequent in the plantations of *Coffea arabica* near Fazenda de Monte Caffé; without fr. Dec. 1860. No. 59.

This is a glabrous plant growing vigorously in cultivated ground, which Dr. Welwitsch was inclined at first to recognise as a distinct species.

Var.  $\beta$  *lanuginosa*.

PRINCE'S ISLAND.—In woods on Pico de Papagaio, frequent: Sept. 1853. No. 18.

SIERRA LEONE.—Frequent in upland woods behind Freetown: Sept. 1853. No. 6.

*Forma glabrior*.

ST. THOMAS.—In woods on lands neglected after cultivation; Dec. 1860. No. 57.

HUILLA.—In neglected fields, now covered with wood, between Monino and Lopollo; Feb. and April 1860. No. 180.

Var.  $\gamma$  *caudata*.

GOLUNGO ALTO.—In upland fields formerly cultivated of Alta Queta, and frequent on the dry plains of Sobado de Bumba; May and June 1856. No. 134.

6. **P. biaurita** Linn. *Sp. Pl.* p. 1076 (1753).

SIERRA LEONE.—Not infrequent in moist places by the rivers near Freetown; Sept. 1853. No. 7.

PRINCE'S ISLAND.—Near rivers among palms near the shore: Sept. 1853. No. 226.

7. **P. atrovirens** Willd. *Sp. Pl. v.* p. 385 (1810).

PRINCE'S ISLAND.—In very shady woods of Pico de Papagaio; Sept. 1853. No. 22.

GOLUNGO ALTO.—Not infrequent in dense woods near Canguera-sange; Oct. 1854 and Sept. 1855. No. 139.

PUNGO ANDONGO.—In shady woods of Barrance de Sengare ; without fr. May 1857. No. 140.

8. **P. spinulifera** Schum. Vid. Sel. Phys. Kjöb. iv, p. 233 (1829).

ST. THOMAS.—In shady forests around Monte Caffé, 2500 ft. ; in fr. Dec. 1860. No. 53.

GOLUNGO ALTO.—Beside rivers in the woods of Barranco do Sangue ; in fr. April 1855. No. 141.

11. **CERATOPTERIS** Brongn. Bull. Soc. Phil. 1821 p. 186 (1821).

**C. thalictroides** Brongn., *l.c.*

ICOLÓ E BENGÓ.—In marshy places at the margin of the lake called Lagoa de Quitunda, near Prata : 14 Sept. 1854. No. 82.

12. **LOMARIA** Willd. in Ges. Nat. Fr. Mag. iii, p. 160 (1809).

**L. Boryana** Willd. Sp. Pl. v, p. 292 (1810).

*Blechnum tabulare* Kuhn, Fil. Afr. p. 94.

HEILLA.—In mountainous districts near the banks of rivulets ; April 1860. No. 203.

13. **ASPLENIUM** Linn. Gen. Pl. p. 322 (1737).

1. **A. sinuatum** Beauv. Fl. d'Oware, ii, p. 33, Pl. 69 (1807).

PRINCE'S ISLAND.—Sept. 1853. No. 24 in part.

Var. Fronds narrow, veins oblique, sori not reaching midrib or margin.

PRINCE'S ISLAND.—On trunks of trees in very shaded places of the Pico de Papagaio, somewhat rare : Sept. 1853. No. 24, in part.

ST. THOMAS.—On old trunks in the densest woods : sparsely fruiting Dec. 1860. No. 64.

2. **A. longicauda** Hook. Second Cent. Ferns, tab. 69 (1861).

ST. THOMAS.—Frequent in shady woods, about 1800 ft. high. In fr. Dec. 1860. No. 63.

3. **A. emarginatum** Beauv. Fl. d'Oware ii, p. 6, Pl. 61 (1807).

GOLUNGO ALTO.—In the dense natural woods of Caculungulu, Sobato de Quilombo Quiacatubia. Fruiting specimens very rare. Jan. 1855. No. 98. Specimens also from Bembe, Congo, collected by Monteiro, 1858, in Herb. Welw.

4. **A. angolense** Baker, Syn. Fil. p. 485 (1874).

PUNGO ANDONGO.—In the shady natural woods of Mata de Quibanga near Sange : Aug. 1855. No. 96.

5. **A. Geppii** Carruth.

Welwitsch, as Mr. Gepp pointed out to me, gave a trivial name to this species which had already been used.

Stipes tufted, 3 to 6 in. long, clothed when young with lanceolate acuminate caducous scales, erect, pale-coloured ; frond 4 to 15 in. long, 2 to 6 in. broad, with 5 to 10 pinnae on each side, which are 1 to  $3\frac{1}{2}$  in. long, and  $\frac{2}{3}$  to  $\frac{3}{4}$  in. broad, stalked, apex acuminate, cuneate at the base, the lower half more oblique, the two sides of the pinna nearly equal, margin crenate or bluntly serrate, terminal pinna somewhat larger than the others ; veins bifurcate except towards the apex of the pinna ; sori and indusium linear, not reaching the margin.

The sori are short in the smaller specimens, and give to this fern the aspect of *A. anisophyllum*, but it is more nearly allied to *A. Prionotis*, having its indusium and sori linear.

PUNGO ANDONGO.—Chiefly on shady rocks in the natural wood called Mata de Pongo : Feb. and April 1857. No. 97.

6. ***A. macrophyllum*** Sw. Syn. Fil. pp. 77, 261 (1806).

PRINCE'S ISLAND.—On shady banks in Pico de Papagaio, with orchids, and *Gleichenia Hermanni* R. Br. Sept. 1853. No. 14.

GOLUNGO ALTO.—Somewhat rare in the very dense natural woods of Alto Queta : July 1855. No. 86.

7. ***A. erectum*** Bory in Willd. Sp. Pl. v. p. 328 (1810).

GOLUNGO ALTO.—Round the source of the Capopo ; Oct. 1854 ; not infrequent in rainy seasons, on the shady banks of the rivers in the mountains of the Alto Queta ; at the end of May 1855. In shady woods by the river of Quibôlo, mountains of Queta ; 19 March 1856. No. 87. Common throughout all the mountain region of Angola and there, at least, not so variable as other species of the genus.

PUNGO ANDONGO.—On the shaded hilly places of Pedra Songue ; Dec. 1856. No. 94.

8. ***A. inaequilaterale*** Willd. Sp. Pl. v. p. 322 (1810).

*A. brachyotus* Kunze, in Linn. x. p. 512.

PUNGO ANDONGO.—By the banks of rivers, at the presidium, not common : Jan. 1857. No. 95.

This may be at once distinguished from the preceding species by the pinnae not decreasing in size downwards.

9. ***A. resectum*** Smith. Ic. ined. Fasc. iii. tab. 72 (1791).

CAZENGO.—By Muxaúlo river in the mountain of the same name. The most beautiful species of *Asplenium* : 12 June 1856. No. 88a. In a single locality, but abundant ; on the rocks near the source of the Capopa, not far from Canguerasange : Oct. 1854. No. 88b. In the primeval forest of Quisnêlo ; 8 Sept. 1855. No. 88b.

10. ***A. formosum*** Willd. Sp. Pl. v. p. 329 (1810).

GOLUNGO ALTO.—On the left of Cuango river, between Cacarambola and N-dele, among palms : Dec. 1855. No. 93a. In the woods of Sobati de Bumba, near the source of the Capopo, but not frequent ; Aug. 1855. No. 93b.

PUNGO ANDONGO.—On the volcanic hills near M-popo, not far from the banks of the Cuanga River : Feb. 1857. No. 93c.

11. ***A. adiantoides*** Lam. Encyc. Meth. ii. p. 309 (1786).

*A. falsum* Retz. Observ. vi. p. 38 (1791). *A. furcatum* Thunb. Prod. Pl. Cap. p. 172 (1794). *A. præmorsum* Sw. Fl. Ind. Occ. iii. p. 1620 (1806).

PUNGO ANDONGO.—On the rocky heights of Pedras de Guingain mossy shaded places ; Jan. 1857. No. 85. In rocky places of the presidium ; Dec. 1856. No. 89, in part. In shaded rocky places of Pedra Cazella, but very rare ; Feb. and April 1857. No. 90. On shaded rocks near Mutu Lucala, at Cuanza river, but not abundant ; March 1857. No. 90b.

GOLUNGO ALTO.—Somewhat rare among rocks in the woods of Alta Queta in shady sub-humid places ; 13 Nov. 1855. No. 91. In somewhat dense woods of Sobati de Bumba above the source of the Capopa, but rare ; end of Aug. 1855. No. 91b.

HUILLA.—On rocks on the highest ridges of the Serra da Xella : Oct. 1859, June 1860, No. 195. In rocky thickets of Morro de Lopollo ; Feb. and May 1860, No. 195b.

12. **A. lividum** Mett. in Linnaea, xxxvi. p. 100 (1869).

PUNGO ANDONGO.—Among rocks north-east of the præsidium in very shaded places, growing with *Chilanthes Welwitschii* ; Dec. 1856, No. 89, in part. In fissures of the rocks of Pedra de Cabondo : Feb. 1857, No. 101.

13. **A. brachypteron** Kze. in Linn. xxiii. p. 232 (1850).

PUNGO ANDONGO.—On wet rocks near the Casalalé in Barrancos da Pedra Songue ; April 1857, No. 92.

Welwitsch distinguished a form growing with this and collected at the same time, characterised by the pinnae not being so obviously dimidiate and having the segments more deeply pinnatifid. No. 92b.

14. **A. Welwitschii** Hook. in Hk. & Bak. Syn. Fil. p. 235 (1868).

GOLUNGO ALTO.—Very rare in the forests of Mati de Quisueula, by the streams with species of *Begonia* and *Marattia* ; 29 April 1856, No. 100.

15. **A. proliferum** Lam. Encyc. Meth. ii. p. 307 (1786).

*A. decussatum* Ser. in Schrad. Journ. Bot. ii. for 1800, p. 51 (1801).

ST. THOMAS'S ISLAND.—In the primitive forests near Fazenda de Monte Caffé, about 2500 ft. ; with fr. Dec. 1860, No. 60. Sub-arborescent, the stem about as thick as the coran, usually 2 in. in diameter, rising only a little above the ground ; fronds 3 to 4 ft., rarely longer.

11. **ACTINIOPTERIS** Link, Fil. Sp. Hort. Berol. p. 79 (1841).

1. **A. radiata** Link, l.c., p. 80 (1841).

PUNGO ANDONGO.—In sunny rocky places of the præsidium ; Dec. 1856, Jan. and April 1857, No. 78.

Of all the smaller ferns which Welwitsch saw in Tropical Africa this he considered the most elegant ; scarcely 3 or 4 in. high, cespitose, somewhat rigid, and where seen very rare.

BUMBO.—Not infrequent in rocky thickets not far from Chaò da Xella, half way up the Serra da Xella. Never seen in the plains of Huilla. Oct. 1859, No. 163.

2. **A. australis** Link, l.c., p. 80.

PUNGO ANDONGO.—On the gneissic, bare, but humid rocks of the præsidium, frequent but only at Barrancos de Catete : Dec. 1856, No. 79.

Probably a few lobed variety of *A. radiata*.

15. **DIDYMOCHLÆNA** Desv. in Gesellsch. Nat. Fremde Berlin Mag. v. p. 303 (1811).

*D. sinuosa* Desv., l.c., (1811).

*D. squamata* Desv. Journ. Bot. vol. vi. p. 282 (1827). *D. lunulata* Desv. Journ. Bot. vol. vi. p. 282 (1827).

ST. THOMAS'S ISLAND.—In the bushy woods of Monte Caffé at an elevation of 2500 to 2800 ft. In fr. Dec. 1860, No. 67. A sub-arborescent form with fronds 3 to 4 ft. long.

16. **NEPHRODIUM** Rich. in Marthe, Cat. Jard. Med. Paris, p. 120 (1801).

1. **N. patens** Desv. Mem. Soc. Linn. Paris, vi. p. 258 (1827).

GOLUNGO ALTO.—On the banks of the Cate in Sobato de Bumba, rare and sporadic. In fr. at the beginning of Oct. 1855. No. 113. By the rivulet Cuango, near Ponte do Felix Simoes. Nov. 1854. No. 130a. An elegant fern with the habit of *Aspidium unitum*, 3 to 4 ft. high, rigid.

2. **N. Spekei** Bak. Syn. Fil. p. 263 (1868).

PUNGO ANDONGO.—In shady places by the rivulet Calunda to the south of the rocks of the præsidium. Jan. 1857. No. 115. Somewhat rare in shady places of the Mata de Pungo. No. 115b. On shady banks in the primitive woods of Mata de Pungo near the præsidium. Feb. 1857. No. 120.

GOLUNGO ALTO.—In shady places in the primitive woods of Quisnula, near Bango. In fr. Sept. 1855. Beside the cataracts of Cuango, near Sange. Dec. 1854, Sept. 1855. No. 120 bis.

A young plant from Alta Queta (Jan. 1855, No. 121), referred here doubtfully by Dr. Welwitsch, is certainly another species, but it is too young to determine.

3. **N. albo-punctatum** Desv. Mem. Soc. Linn. Paris, vi. p. 255 (1827).

PUNGO ANDONGO.—Somewhat rare in one place on gneissose rock, north-east of the præsidium behind Catete. Dec. 1856. No. 110. A fern with a long, horizontally creeping rhizome, and erect somewhat rigid fronds.

HUILLA.—In somewhat humid rocky places of Morro de Lopollo, towards Empalanca. Feb. and May 1860. No. 193.

4. **N. Thelypteris** Desv., *l.c.*, p. 257 (1827).

HUILLA.—Somewhat rare by the banks of the river Monino, almost hidden among tall *Cyperaceæ*; in fr. April 1860. No. 185.

5. **N. Welwitschii** Bak. Syn. Fil. p. 275 (1868).

*Aspidium piunnatifido-serratum* Mett. in Kuhn, Fil. Afr. p. 139 (1868).

GOLUNGO ALTO.—Very rare in shady places by the rivulets of the Serra de Alta Queta. Nov. 1854. No. 123.

6. **N. athamanticum** Hk. Sp. Fil. iv. p. 125 (1862).

HUILLA.—In deep holes made by porcupines near the banks of the river Humpata. Feb. and April 1860. No. 194. Caespitose, 3 ft. high, erect, somewhat rigid, with the habit of European *Aspidia*. Indusium truly reniform.

7. **N. hirsutum** Don, Prod. Fl. Nep. p. 6 (1825).

*Polypodium crenatum* Forsk. Fl. Egypt. p. 185 (1775). *N. eriocarpum* Dec. Ann. Mus. ii. p. 185 (1841). *N. odoratum* Baker, Syn. Fil. p. 280 (1868).

ST. VINCENT, CAPE DE VERDE ISLANDS.—On the volcanic rocks at the summit of Monte Verde. Sept. 1853. No. 1.

8. **N. subquinquefidum** Hook. Sp. Fil. iv. p. 130 (1862).

PRINCE'S ISLAND.—In woods in the mountains of the Pico de Papagaio, along with *Lycopodium cernuum*. Sept. 1853. No. 16. Pinnules scarcely or not divided and generally obtuse.

9. **N. variabile** Hook. Sp. Fil. iv. p. 140 (1862).

*Aspidium speciosum* Mett. in Ettingsh. Farnkr. p. 180 (1865).  
*N. Vogelii* Hook., *i.e.*, p. 130.

GOLUNGO ALTO.—By the banks of rivulets near Zengas do Queta. July 1856. Nos. 106, 107.

Dr. Welwitsch considered this to be a trifid variety of the previous species. It may easily be distinguished by the triangular outline of the lower pinnae, in which the pinnule of the lower side is not abnormally large, so that the outline of the frond is deltoid acuminata or somewhat five-angled. It is very polymorphic. Young specimens in No. 107 are the form named by Hooker *N. Vogelii*.

10. **N. unitum** R. Br. Prod. Fl. Nov. Holl. p. 148 (1810).

PUNGO ANDONGO.—Frequent on the banks of the Cuanza between Condo and Quisonde, etc. A gregarious fern with creeping rhizomes 4 to 12 ft. long, erect fronds; sometimes floating on the water; in fr. March 1857. Very frequent on the shores of the island Calemba, March 1857. On the banks of the Cuanza, near Candumiba. Jan. 1857. No. 111.

GOLUNGO ALTO. Frequent, but only in one place, on the marshy margins of the Casuballa in Sobato de Bumba, along with orchids and species of *Nanhaea*. 22 Oct. 1855. No. 112.

CAZENGO.—In marshes with *Cyperus* and *Papgrus* around Lagoa de Moembexe, near Dalatando; June 1855. No. 114.

11. **N. venulosum** Hk. Sp. Fil. iv. p. 71 (1862).

PRINCE'S ISLAND. In very dense woods from the sea-shore to 1000 ft.; frequently 3 to 7 ft. high; Sept. 1853. No. 21.

GOLUNGO ALTO.—In spongy marshes on the banks of the Quiapoze, near Canguerasange, close to the chief's residence, near the spring on the right bank; Oct. 1854. No. 117. Near the streams in the primitive forests of Sobato de Quilombo Quiacatubia, in the locality where *Rhipsalis* is found; Jan. 1855. No. 118. In the primitive forests of Quisacula; 9 Sept. 1855. No. 118b.

12. **N. molle** Desv. Mem. Soc. Linn. Paris, vi. p. 258 (1827).

*Polypodium molle* Jacq. Collect. iii. p. 188 (1789).

SIERRA LEONE.—Near Freetown in shady woods, frequent; Sept. 1853. No. 4.

ST. THOMAS'S ISLAND.—In dense primitive forests beside rivulets, near Novo Destino; in fr. Dec. 1860. No. 61. By rivulets in rocky places near Monte Caffé; Dec. 1860. No. 65.

GOLUNGO ALTO.—On the banks near waterfalls of the river Cuango; in fr. early in Aug. 1855. No. 122. On the densely grassy margins of the rivulet Quiapoze, near Sange, with *Pteris angustifrons*, but not frequent; April 1856. No. 129. Sparingly on the banks of the rivulet Muria; 18 Sept. 1854. No. 129b. At the public fountain in Banza de Bango, with *Anthoceros* and *Marchantia*; 7 Sept. 1855. No. 129c. In the woods of Sobato de Quilombo Quiacatubia; July 1855. No. 130b.

HUILA.—In shady woods of Parinaria Nocha, in moist places, flooded in summer. Lopollo, Feb. 1860. No. 196.

13. **N. hippocrepis** Desv. in Mem. Soc. Linn. Paris, vi. p. 259 (1827).

*Polypodium hippocrepis* Jacq. Collect. p. 186 (1789). *Polypodium cicutarium* Linn. Syst. Nat. ed. x. p. 1326 (1759). *Nephrodium cicutarium* Baker, Syn. Fil. p. 299 (1868).

PRINCE'S ISLAND.—By springs on shady rocks near the sea ; Sept. 1853. No. 12. Gregarious, but in few woody places about 1500 ft. between the city and Monte Caffé ; in fr. Dec. 1860. No. 62.

PUNGO ANDONGO.—Sparsely in shady places of Mata de Pungo ; in fr. middle of March 1857. No. 102

GOLUNGO ALTO.—Very abundant at the falls of the river Coango in shady woods. Specimens with round tubercles on the main rachis on the upper or under surface of the frond are intermixed with the usual forms ; in fr. Aug. 1855. No. 103 and 103b.

A beautiful fern with caespitose stipes and fronds 3 and 4 ft. high. The stipes and rachises in all the specimens collected in Golungo Alto were without glandulose hairs, while the specimens in No. 62 have them.

Two young plants belonging probably to *Nephrodium* were in Dr. Welwitsch's Herb. : one, No. 131, from the banks of the river Casabala Sobato de Bumba, July 1856, the other, No. 184, found near the cataract of Ferrão da Sola ; April 1860.

### 17. NEPHROLEPIS Schott, Gen. Fil. (1834).

1. **N. tuberosa** Presl, Tent. Pter. p. 79 (1836).

*Aspidium tuberosum* Bory in Willd. Sp. Pl. v. p. 234 (1810).

SIERRA LEONE.—Frequent on old shady walls in Freetown, growing with various Hepaticas and species of *Scytonema* ; Sept. 1853. No. 8.

Welwitsch notes that the sori in his specimens are on the margin of the pinnae.

2. **N. exaltata** Schott, Gen. Fil. (1834).

GOLUNGO ALTO.—Not infrequent on the old trunks of *Elaeis guineensis* and other trees between Bango and Sange ; in fr. Jan. and May 1855, and June 1856. No. 144.

PUNGO ANDONGO.—On decaying bare trunks of *Melia Bombolo* Welw. in the presidium itself ; Dec. 1856. No. 145.

These plants are always tuberous ; the tubers are ellipsoid, and contain a dense subflavescens flesh. Welwitsch considered the specimens to be only a variety of *N. tuberosa* Presl.

3. **N. biserrata** Schott, Gen. Fil. (1834).

*N. acuta* Presl, Tent. Pter. p. 79 (1836).

PRINCE'S ISLAND.—In dense humid woods, frequent. Full grown plants 6 to 7 ft. high : Sept. 1853. No. 23.

GOLUNGO ALTO.—Very common in the shady woods of Quilombo Quiacatubia, about 2000 ft. altitude ; in fr. Jan. 1855. In the primitive forests on palms, growing among the bases of the petioles, in the Serra do Alto Queta ; in fr. June 1856. No. 108.

Var.  $\beta$ , *diplotis* Welw. The base of the pinnae equally auriculate on both sides.

PRINCE'S ISLAND.—From 100 to 500 ft. altitude ; Sept. 1853. No. 23b.

4. **N. trichomanoides** J. Sm. in Hk. Journ. Bot. iii. p. 413 (1841) ; in Presl, Epim. Bot. p. 44 (with deser.) (1849).

*N. repens* Brack. U.S. Expl. Exped., Botany p. 209 (1854). *N. ramosa* T. Moore, Ind. Fil. p. 102 (1858). *N. oblitterata* Hook (non *Nephrodium oblitteratum* R. Br.) Sp. Fil. iv. p. 154 (1862).

ST. THOMAS.—Climbing on old living trunks in woods, to about

2500 ft. on Monte Caffé, the apices of the fronds more or less patent : in fr. Dec. 1860. No. 55.

18. **OLEANDRA** Cav. Deser. Pl. I. p. 252 (1802).

**O. articulata** Presl, Tent. Pterig. p. 78 (1836).

ST. THOMAS'S ISLAND.—In shady primitive woods around Fazenda do Monte Caffé, about 2000 ft. alt.; without fr. Dec. 1860. No. 52.

Var.  $\beta$ . **Welwitschii** Baker, Syn. Fil. p. 303 (1868).

HUILLA.—Somewhat rare in woods near the waterfalls at the foot of Ferrão da Sola near Lopollo : Feb. and April 1860. No. 188.

19. **POLYPODIUM** Linn. Gen. Pl. p. 322 (1737).

1. **P. proliferum** Koenig (non Kaulf. nec Presl) in Retz., Obs. Bot. vi. p. 38 (1791).

GOLUNGO ALTO.—Not frequent by the banks of the Múria, between the place called Múria and Trombeta, with a slender species of *Polygomum* : 18 Sept. 1854. No. 119.

2. **P. Schimperianum** Mett. in Schweinf. Beitr. p. 303 (1867), and Kuhn, Fil. Afr. p. 152 (1868).

PUNGO ANDONGO.—On the rocky banks of the River Cazella between Pungo Andongo and Luxillo ; in fr. Nov. 1856. No. 152.

3. **P. simplex** Sw. in Sehrad. Journ. Bot. ii. jur. 1800, p. 19 (1801).

*P. excavatum* Bory in Willd. Sp. Pl. v. p. 158 (1810). *P. sesquipedale* Kuhn, Fil. Afr. p. 153 (non Wall.).

PUNGO ANDONGO.—In shaded as well as exposed rocks of the prasidium near Catete and elsewhere ; in fr. Jan. 1857. No. 104. Growing with asparagus, thick-leaved orchids, etc., on the gneissose rocks. Fronds rigid, sori yellow.

4. **P. lycopodioides** Linn. Sp. Pl. p. 1082 (1753).

GOLUNGO ALTO.—Not infrequent, but not observed in many places, in dense woods of Serra do Alto Queta ; in fr. Feb. 1855. No. 105.

Rhizome very long, climbing 10 to 20 ft. on the stems of old trees.

5. **P. irioides** Lam. Enc. Meth. Bot. v. p. 513 (1804).

*P. punctatum* Kuhn (non Sw.) Fil. Afr. p. 151.

PRINCE'S ISLAND.—Sporadic, on old trunks of trees in woods near the sea : in fr. Sept. 1853. No. 25.

GOLUNGO ALTO.—Sporadic on the larger branches of old trees ; without fr. April 1856. No. 99.

6. **P. Phymatodes** Linn. Mantissa ii. p. 305 (1771).

PRINCE'S ISLAND.—On old trunks of palms and on the earth in densely shady places not far from the sea : Sept. 1853. No. 9.

ST. THOMAS'S ISLAND.—On old trunks in the woods of Monte Caffé up to 2800 ft., not infrequent, Dec. 1860. No. 51. This fern has a strong and pleasant fragrance.

7. **P. Willdenovii** Bory in Ann. Sc. Nat. Ser. i. vol. v. p. 468 (1825).

*P. propinquum* Hk. pro parte (non Wall.) Syn. Fil. p. 367.

PRINCE'S ISLAND.—Growing, but rarely, on old tree trunks in the woods near the sea ; Sept. 1853. No. 17.

ST. THOMAS'S ISLAND.—Frequent on the old tree trunks in the woods of Monte Caffé from 2000 to 2500 ft. ; Dec. 1860. No. 69.

20. **NOTHOLÆNA** R. Br. Prod. p. 145 (1810).

**N. inæqualis** Kunze, Farrnkr. p. 146 (1840-47).

PUNGO ANDONGO.—On the rocks of Pedra Songue and in fissures in the rocks near Caghuy ; end of March and beginning of April. In holes and fissures in the rocks of the præsidium (Pedra Cabondo). April 1857. No. 147.

HUILLA.—On the scattered rocks in the plain called Empalanca between Lopollo and Humpata ; Oct. 1859, May 1860. No. 197.

21. **GYMNOGRAMMA** Desv. Berlin Mag. v. Jahrg. p. 304 (1811).

1. **G. cordata** Schlecht. Adumb. Pl. p. 16 (1825).

HUILLA.—Sparsely on the schistose rocks of Morro de Monino ; in fr. April 1860. No. 190.

2. **G. rosea** Desv. Berlin Mag. v. Jahrb. p. 306 (1811).

*G. conspersa* Kze. Farrnkr. p. 225 (1840-47). *G. argentea* Mett. in Kuhn, Fil. Afr. p. 59 (1868), Baker Syn. Fil. ed. ii. p. 385 (1874).

HUILLA.—Pendulous from the fissures of rocks of Morro de Monino ; in fr. April 1860. No. 199.

22. **VITTARIA** J. E. Smith, Mem. Acad. Turin. v. 413 (1793).

**V. elongata** Sw. Syn. Fil. pp. 109, 302 (1806).

PRINCE'S ISLAND.—On old trunks of palms in primitive woods ; without fr. Sept. 1853. No. 13.

23. **ACROSTICHUM** Linn. Gen. Pl. 322 (1737).

1. **A. Welwitschii** Baker, Syn. Fil. ed. ii. p. 521 (1874).

HUILLA.—On wet rocks at the cataracts near Ferrão do Sola, Lopollo ; without fr. May 1860. No. 187.

A caespitose plant with subpendulous fronds.

2. **A. guineense**.

*Lomariopsis guineensis* Kuhn, Fil. Afr. p. 53 (1868). *L. marginata* Kuhn in Sched. Schweinfurth, Reise nach Trop. Afr. No. 3607. *Acrostichum sorbifolium* Hk. & Bak. Syn. Fil. p. 412 (1868).

ST. THOMAS'S ISLAND.—Not infrequent in the primeval woods about Fazenda, Monte Caffé ; in fr. Dec. 1860. No. 68.

3. **A. gaboonense** Hk. Sp. Fil. v. p. 270 (1874).

GOLUNGO ALTO.—In very shady primitive woods of the mountains Cungulungulo ; Feb. 1855. No. 155.

4. **A. Boivini** Welw. ms.

*Chrysodium Boivini* Mett. in Kuhn, Fil. Afr. p. 51.

GOLUNGO ALTO.—In shady places in the primitive woods of the Cungulungulo mountains, near Graça's house, Montalegre, in places where *Coffea arabica* is indigenous ; in fr. Dec. 1855. No. 156.

5. *A. punctatum* Linn. Suppl. Pl. p. 444 (1781), non Linn. Sp. Pl. ed. ii. p. 1524 (1763), which is *Polypodium iroides* Lam.

Swartz (Syn. Fil. p. 13) misquotes the Linnaean name as *punctulatum*, and this altered form has been followed by most authors.

ST. THOMAS'S ISLAND.—In very shaded woods above Fazenda de Monte Caffé; in fr. Dec. 1860. No. 58.

GOLUNGO ALTO.—In the densely shaded and very elevated woods of Quilombo Quiacatubia; Jan. 1855. No. 153.

The plant from St. Thomas's Island was named by Sir William Hooker *A. fluviale*, but Welwitsch points out that it is obviously only a form and not a variety of *A. punctatum*. It has the main veins distinct, and consequently belongs to the *Gymnopteris* section of the genus.

#### Var. *angolense*.

*A. angolense* Welw. ms. *Chrysodium* sp. nov. Mett. in Kuhn Fil. Afr. p. 52.

GOLUNGO ALTO.—In the dry dense woods of the mountains of Cungulungulo, about 2800 ft. altitude, at Montalegre. No. 157.

Welwitsch and Mettenius considered this fern should rank as a distinct species. Welwitsch separates it because the fronds are imparipinnate to the apex; the pinnae are distinctly petiolate, and a bulbil is found at the base of the last pinna. The pinnae of the upper part of the frond are subsessile; they have in the barren frond long acuminate apices, while the pinnae of the fertile fronds are three or four times narrower, and shortly acuminate.

In all essential characters this plant so closely agrees with *A. punctatum* that it seems to deserve a place only as a variety of that species.

#### 6. *A. Afzelii*.

*Hemionitis acrostichoides* Afzel. in Sw. in Schrader, Journ. Bot. (1800) ii. p. 17 (1801). *Polybotrya acrostichoides* Mett. in Kuhn Fil. Afr. p. 52.

ST. THOMAS'S ISLAND.—On Monte Caffé along with specimens of *Asplenium longicauda* Hk.; without fr. Dec. 1860. No. 636.

PUNGO ANDONGO.—On shaded banks near the cataract of Cabondo; in fr. May 1857. No. 154.

Fronds dimorphous, coriaceous, rhizome extensively creeping horizontally.

This fern is nearly allied to *A. contaminans* Wall. one of the species included by Mr. Baker in *A. cirens* Wall. In *A. contaminans* the two, three, or four secondary veins run out from the vein free, while in the African species the meshes of the secondary veins continue to or almost to the margin, and only the veinlets reach the margin free.

#### 7. *A. aureum* Linn. Sp. Pl. p. 1069 (1753).

PRINCE'S ISLAND.—By the rivulets near the sea-coast, and with *Rhizophora*; Sept. 1853. No. 15.

BARRO DO DANDE.—Frequent, forming masses in the brackish places, often with *Rhizophora*, and *Dipterocarpus* at the mouth of the river Dande; in fr. Sept. 1858. No. 158.

A noble fern, with a creeping rhizome, often nearly as thick as a small arm; fronds 3 to 6 ft. high, with coriaceous pinnae, the uppermost 5 to 7 ft., bearing the fruit. The fronds erect, rigid. Almost without doubt a halophyte.

24. **PLATYCERIUM** Desv. in Annal. Soc. Linn. Paris, vi. p. 213 (1827).

1. **P. stemmaria** Desv., *l.c. (stemaria)*.

PRINCE'S ISLAND.—On the trunks of old trees in the dense woods of the island. The most singular and beautiful of the African ferns; Sept. 1853. Nos. 20 and 20b.

AMBRIZ.—On the old trunks of *Adansonia* in the rocky woods between Ambriz and Quisembo: Nov. 1853; No. 160.

For the synonymy of this and other species of *Platycerium* see Journ. Bot. 1900, p. 125.

2. **P. angolense** Welw. in Hk. & Baker, Syn. Fil. p. 245 (1868).

*P. elephantotis* Schweinf. Bot. Zeit. xxix. p. 361 (1871).

GOLUNGO ALTO.—Sparse on trunks of *Stereulia*, etc., in the primeval woods near Quilombo Quiacatubia: in fr. Jan. 1855. No. 160. On trunks of palm, *Stereulia*, etc., near Sange; Jan. 1855. No. 160<sup>2</sup>.

Welwitsch describes the pendulous fertile fronds as simple, not forked, obcuneate, very obtuse at the rounded dilated apex, and gradually decreasing towards the long base. These characters are given by Schweinfurth, and clearly shown in his woodcut. They fully justify the specific rank of these plants, though Mr. Baker in his New Ferns, p. 114 (1892), places the species under *P. stemmaria* Desv.

25. **OSMUNDA** Linn. Gen. Pl. p. 322 (1737).

**O. regalis** Linn. Sp. Pl. p. 1065 (1753).

HUILLA.—In shaded marshy places at the waterfalls near Lopollo, with species of *Cyathea* and *Metroxylon*; 31 Oct. 1859. No. 165.

26. **ANEMIA** Sw. Syn. Fil. pp. xiii. 155 (1806).

**A. Schimperiana** Presl, Suppl. Tent. p. 84 (1845).

*A. tomentosa* Sw.  $\beta$  *Schimperiana* T. Moore, Ind. Fil. p. 70 (1857).

HUILLA.—Seen only in rocky places of Morro de Monino at an altitude of 5600 ft.; in fr. at the end of April 1860. No. 164.

27. **LYGODIUM** Sw. Journ. Bot. p. 107 (1801).

**L. Smithianum** Presl, Suppl. Tent. p. 112 (1845), Kuhn, Fil. Afr. p. 169.

GOLUNGO ALTO.—Rare in very dense woods of Mata de Mangue, near Sange: in fr. May and July 1856. No. 81. In shady places in Alto Queta; in early state without fr. April, May, July and Aug. 1855. No. 80.

28. **MARATTIA** Sw. Nov. Gen. et Sp. Pl. p. 128 (1788).

**M. fraxinea** Smith Ic. Ined. xlvi. (1790).

ST. THOMAS'S ISLAND.—Frequent in the primitive shady and humid forests near Monte Caffé, 2500 ft.; in fr. Dec. 1860. No. 70.

GOLUNGO ALTO.—Very rare in the humid shady woods on the mountains of Alto Queta; in fr. June 1855. Mata de Quisucula: July 1867. No. 84. Young fronds; Mata de Quisucula; 8 Sept. 1855. No. 84 bis.

29. **OPHIOGLOSSUM** Linn. Gen. Pl. p. 322 (1737).

1. **O. gramineum** Willd. Nova Acta Acad. Erfurt. ii. p. 18 (1802).  
*O. gracillimum* Welw. ms. in Kuhn, Fil. Afr. p. 177 (1868).

*O. lusitanicum* Linn. var. *gracillimum* A. Br. in Kuhn, Fil. Afr. p. 177 (1868).

PUNGO ANDONGO.—In bare pastures on the rocky banks of the rivers near Catete; in fr. Jan. and Feb. 1867. Nos. 36a, 36b.

2. **O. luso-africanum** Welw. in Prantl in Eichler Jahrb. iii p. 312 (1884).

PUNGO ANDONGO. In pastures on gneissose rocks of the presidium, 3500 ft.; middle of Jan. 1857. No. 34.

3. **O. Gomezianum** Welw. in Kuhn, Fil. Afr. p. 176 (1868).

PUNGO ANDONGO.—In bare pastures near the rivers, along with *O. rubellum* Welw., near Catete; Jan. and Feb. 1857. No. 35. In wet pastures, inundated in summer, on sandy mud with Xyrids, Antrolepids, Eriocaulons, and sedges, high up on Morro de Lopollo towards Empalanea; in fr. April 1860. No. 161.

4. **O. ellipticum** Welw. ms.

*O. Gomezianum* Welw. var. *latifolium* Prantl in Eichler Jahrb. iii p. 316.

Rhizome cylindrical: leaves ovate, obtuse or bluntly acute, opaque; median nerve not pronounced, disappearing two-thirds along the lamina; areole of the centre elongated, beyond as broad as long; sporangia 5 to 8 on each row; apex short, subacute.

PUNGO ANDONGO.—In bare pastures only on soil covering rocks by the river Tangue near Catete, along with *O. gramineum* Willd., but much less common; Feb. 1857. No. 32.

5. **O. rubellum** Welw. in Kuhn, Fil. Afr. p. 179 (1868).

PUNGO ANDONGO.—Frequent in bare pastures near the banks of the rivulets near Catete, and near Candumba on the river Cuanza: Jan. and Feb. 1857. Nos. 33, 33b.

6. **O. fibrosum** Schum. Dansk. Selsk. Afh. iv. p. 226 (1829).

PUNGO ANDONGO.—In rocky pastures in the primitive forests between Quibala and Cabanga; in fr. 28 Dec. 1856. No. 31. In similar pastures of Sierra de Pedras de Guinga to about 4000 ft.; March 1857. No. 31b.

7. **O. reticulatum** Linn. Sp. Pl. p. 1063 (1753).

PUNGO ANDONGO.—In slopes with bare pasture of Pedra de S. Antonio in the præsidium; in fr. Dec. 1856, Jan. and Feb. 1857. No. 28. In bare and bushy pastures of Pedras de Guinga: Jan. 1857. No. 29.

ST. THOMAS'S ISLAND.—Not infrequent and gregarious in inundated pastures near the rivulet banks, scarcely 10 or 20 ft. above sea-level, and not far from the shore; in fr. Dec. 1860. No. 30.

## EQUISETACEAE.

**EQUISETUM** Linn. Gen. Plant. p. 322 (1737).

1. **Equisetum ramosissimum** Desf. Fl. Atlantica ii. p. 398 (1800).

Var. 16. **Burchellii** Milde, Monogr. Equis. p. 443 (1865).

*E. Burchellii* Vauch. Monogr. Preles, p. 47. t. 10.

MOSSAMEDES.—Frequent in wet places at the mouth of the river Giraúl; in fruit 18 July 1859. No. 176.

## MOSSES.

BY ANTONY GEPP, M.A., F.L.S.

1. **SPHAGNUM** Dill. Hist. Musc. p. 240 (1741); Hedw. Fund. Muse. II. p. 85 (1782).

1. **S. africanum** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 216 (1871), t. i. fig. 1.

HUILLA.—Common in boggy spots by cold mountain rills, Morro de Lopollo and Morro de Monino at an elevation of 5500 ft. ; without fr. in Dec. 1859 and April 1860. Nos. 11, 12.

2. **TREMATODON** Rich. in Mich. Fl. Amer. bor. II. p. 289 (1803).

1. **T. intermedius** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 226 (1871), t. iii. fig. 6.

HUILLA.—A fine moss, common and fruiting abundantly, on the muddy banks of the brook of Lopollo, tinging broad areas with a green-flavescens colour, short-lived, lasting barely three months, but continually renewing itself in the same damp spots : Feb. 1860. No. 9. In caverns excavated by porcupines in woods of Proteaceæ between Lopollo and Monino ; with fr. middle of May 1860. No. 20.

Var. **β. nanus** Welw. et Duby, l.c., p. 227.

PUNGO ANDONGO.—Gregarious but not cespitose : seta yellow ; theca orange-red,  $^1$  to  $^1$  as long as the slightly arcuate apophysis. Rather rare, among Hepaticæ on moist ground in rocky places at an elevation of 3500 ft., Pedra Cazella ; with fr. beginning of May 1857. No. 58.

2. **T. angolensis** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 227 (1871), t. iv. fig. 5.

HUILLA.—In tufts of *T. intermedius* in pastures of short grass inundated in summer, among Cyperaceæ and Xyridaceæ near Catumba, where also *Anagallis pumila* Sw. was collected ; with fr. Dec. 1859. No. 47.

3. **CAMPYLOPUS** Brid. Mant. Musc. p. 71 (1819).

1. **C. horridus** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 222 (1871), t. iv. fig. 1.

PUNGO ANDONGO.—On moist rather shaded rocks, Pedra Songue (Barranco grande) ; without fr. April 1857. No. 76.

Also gathered at Lunda to the east of Casange by D. Livingstone and given by him to Welwitsch in May 1855. No. 116.

2. **C. Schwarpii** Schimper Bryol. Eur. Suppl. Fase. i. ii. (1864).

**HUILLA.**—On woodland rocks on the way from Morro de Lopollo towards Humpata, at the spot where the first Ericaceous plant, *Blavia setulosa* (Herb. Welw. No. 2558), grows in plenty : May 1860. No. 35. In marshy wooded places alongside streams near Humpata at an elevation of about 4500 ft. : without fr. May 1860. No. 40.

3. **C. sciuroideus** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 220 (1871), t. ii. fig. 4.

**HUILLA.**—On rich soil covering the upper schistose rocks of Morro de Lopollo : without fr. April 1860. No. 10

**PUNGO ANDONGO.**—Very widely cespitose : stems 3 in. to 1 ft. high : leaves shiny : on the upper rocks near Mata de Pungo, at an elevation of 3400 ft. : Dec. 1856, Feb. and May 1857. Frequent near Cazella in company with *Polytrichum* : Jan. 1857. No. 54.

4. **C. montanus** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 221 (1871), t. iii. fig. 1.

**HUILLA.**—In wide tufts of a brilliant golden-green hue, on moist schistose rocks in elevated woods (5300 to 5600 ft.), Morro de Lopollo and Morro de Monino : without fr. at the beginning of April 1860. No. 3. At the foot of old trees and on the ground contiguous in the woods of Monino, moist rocky spots at the great elevation of 5000 to 5500 ft. : without fr. May 1860. No. 5.

5. **C. Aethiops** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 221 (1871), t. iii. fig. 2.

**PUNGO ANDONGO.**—On lofty moist rocks by the springs of Pedra de Songne where *Musa ventricosa* grows, at an elevation of 3100 to 3900 ft. : without fr. Feb. to April 1857. No. 64.

4. **LEUCOPHANES** Brid. Bry. Univ. I. p. 763 (1826).1. **L. unguiculatum** Mitt. in Journ. Linn. Soc. vii. p. 150 (1864).

**PRINCE'S ISLAND.**—At the base of palm-trunks (*Elaeis guineensis*), gathered by Gustav Mann : without fr. No. 200.

2. **L. (?) sphagnoides** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 443 (1872).

**HUILLA.** Common in boggy spots among the elevated rocks of Morro de Monino, without fr. April 1860. No. 13.

Duby (*l.c.*) quotes specimens gathered by Welwitseh in Pungo Andongo and by Livingstone in the kingdom of Lunda. The latter specimen is not in the British Museum set ; and the former is probably represented by the following number :—

**PUNGO ANDONGO.**—A white glaucous *Leucobryum*, very widely cespitose, occurring in rather lax tufts 2 to 4 ft. wide and 2 to 7 in. deep, with branches few and very fragile : common in rocky thickety places within the præsidium, growing in company with fruticose *Orchidea*, and forming a humus for them : always sterile ; Dec., Feb., May 1857. No. 48

5. **OCTOBLEPHARUM** Hedw. Musc. Frond. iii. p. 15 (1791).1. **O. albidum** Hedw., *l.c.*, p. 15, t. vi. A.

*Bryum albidum* L. Sp. Pl. edit. ii. p. 1583 (1763).

**SIERRA LEONE.**—On living trunks of *Mangifera indica* and *Dracena*

sp., not uncommon in woods composed of these trees, near Freetown, but sparingly with fr. Sept. 1853; gathered on an excursion interrupted by torrents of rain. No. 122.

PUNGO ANDONGO.—On old tree-trunks in the denser primitive woods, but in no wise producing fruit every year; in the rainy season flavo-virescent, in the dry season silvery-white, glistening and becoming black; Mata da Pedra Pungo, within the præsidium; April 1857. No. 67. Albido-virescent in the living state, but quite white when dried up: laxly cæspitose on the moist rocks of Pedra de Songue, at an elevation of 3500 ft.; without fr. April 1857. No. 67b. On the cleft rocks of Pedra S. Antonio within the præsidium, but sparingly; with fr. April 1857. No. 67c.

GOLUNGO ALTO.—On old palm-trunks (*Elaeis guineensis*) in very dense moist woods near Calolo: two or three capsules found with opercula; Sept. 1857. No. 130. On various old trees, Mata de Quisucuña; with fr. Feb. 1856. No. 130c.

#### 6. **HYOPHILA** Brid. Bryol. Univ. I. p. 760 (1826).

1. **H. gymnostomoides** Jaeg. Gen. et Sp. Musc. I. p. 202 (1873).

*Pottia gymnostomoides* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 226 (1871), t. iv. fig. 4.

PUNGO ANDONGO.—A gymnostomoid moss, occurring in wide, intensely green patches on shaded rocks near the cataract of the great river Cuanza near Condo; with fr. March 1857. No. 78.

#### 2. **H. compacta** Jaeg. Gen. et Sp. Musc. I. p. 203 (1873).

*Pottia compacta* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 225 (1871), t. iii. fig. 5.

HUILLA.—A small, compactly pulvinate moss, almost black or greenish-black when alive and when dried, with capsule orange-yellow on a yellowish seta. In sandy woods of Proteaceæ, around and on the conical ant-hills of termites (*i.e.* Salalè) between Lopollo and Monino; with fr. April 1860.

PUNGO ANDONGO.—In open muddy spots in fissures of rocks by the great waterfall of the river Cuanza near Condo; with unripe fr. March 1857.

#### 7. **BARBULA** Hedw. Fund. Musc. II. p. 92 (1782).

1. **B. unguiculata** Hedw. Musc. Frond. I. p. 59. t. 23 (1787); var. **apiculata** Br., Sch. et Guemb. Bry. Eur. II. t. 143, γ (1836-51).

*B. apiculata* Hedw. Sp. Musc. p. 117, t. xxvi. f. 1-3 (1801) var. ex Welw. et Duby in sched.

GOLUNGO ALTO.—On exposed rocks near Zensala de Bumba; with fr. May 1855. No. 133. In exposed sparsely grassy places near Banza de Bango Aquitamba; with fr. May 1856. No. 134. On shaded clayey soil in woods from Quibolo down to the western base of Alto Queta, at an elevation of 2100 ft.; with fr. June 1856. No. 135.

Here should be added the three following numbers, at present indeterminate:—

PUNGO ANDONGO.—A humble little moss of dusky-green hue, very densely cæspitose, on the most lofty rocks of the præsidium, in the part called Pedra de Cazella; sterile, April and May 1857. No. 87. A brown-green plant, densely cæspitose; shoots laxly aggregated, easily detached; on exposed wet soil near Catete; sterile, middle of May

1857. No. 90. In small quantity on moist ground in the more elevated rocky parts of Pedra de S. Antonio, within the presidium; sterile, May 1857. No. 119.

8. **SYRRHOPODON** Schwaegr. Suppl. II. i. p. 110 (1824).

1. **S. Welwitschii** Besch. in Ann. Sci. Nat. sér. 7, tom. i. p. 307 (1895).

*Calymperes? Welwitschii* Duby in Genève, Mem. Soc. Phys. XXI, ii. p. 444, t. iv, fig. 8 (1872).

HUILLA.—On moist soil at the foot of rotting trunks in swampy woods near Humpata; without fr. May 1860. No. 6.

Bescherelle (*loc. cit.*) has indicated the affinity of this plant to *Syrrhopodon Spruceanus* Mitt.

Another species, indeterminate, is represented by the following number:—

GOLUNGO ALTO.—On the base of trunks and on fallen branches on the ground in the primitive forests of Cungulungulo; sterile, July 1856. No. 129c.

9. **CALYMPERES** Swartz ex Weber, Tabula exhib. Calyptr. Oper. (1813).

1. **C. Afzeli** Swartz in Spreng. Schrad. et Link, Jahrb. d. Gewächsk. I. i. p. 3 (1818), c. tab.

GOLUNGO ALTO.—Cespitose, bright green; stems erect; leaves widely sheathing, much crisped and twisted by drought; calyptre acutely angulate, flavescent; at an elevation of about 2000 ft. On palm-trunks (*Elaeis guineensis*) in shady woods on the banks of the river Cuango; without fr. June 1856. No. 129. Common, but rarely bearing fr. on palm-stems, etc.; found with fr. on *Raphia textilis* Welw. on Caminho (road) para Mussengue near Sange, on the eve of Welwitsch's departure, Aug. 1857. No. 129b.

10. **ZYGODON** Hook. et Tayl. Muse. Brit. ed. i. p. 70 (1818).

1. **Z. Welwitschii** Duby in Genève, Mém. Soc. Phys. XXI, ii. p. 444, t. 1, fig. 7 (1872).

HUILLA.—A minute moss, remarkable for the many and prominent ribs on its capsule. A great rarity, found in one place only, very sparingly interspersed in tufts of *Brachynium angolense*, on old trunks of a Sapotaceous kind of tree called "Mutambote" (*Chrysophyllum argyrophyllum*) in the mountain woods of Morro de Lopollo at an elevation of 5100 ft.; at the end of March 1860. No. 27.

11. **SCHLOTHEIMIA** Schwaegr. Muse. Recent. Suppl. ii. p. 16 (1812).

1. **S. rugifolia** Brid. in Breyer, Univ. I. p. 322 (1826).

*Orthotrichum rugifolium* Hook. Muse. Exot. II. t. 128 (1820).

GOLUNGO ALTO.—In broad tufts on old trunks of a tree called "Mucumba-Camba" (*Loxylon exsertum* Hiern, Herb Welw. No. 1559) in woody places near Sange, Dec. 1854. No. 132. Cespitose on tree-trunks in Queta Orient; gathered with a solitary capsule and a few fallen calyptres; July 1856. No. 132b.

PUNGO ANDONGO.—A widely cespitose, fulvous-green moss,

calypters flavescent, splitting at base into eight regular subtruncate laciniae. On branches of *Xerophyta squarrosa* Baker (Hb. Welw. No. 1555), often entirely enveloping them, on elevated rocks of the præsidium, seldom bearing fr., but found with fr. at Barranco de Catete ; April, May, 1857. No. 66.

This species was previously known to occur in Brazil only ; and the original plant was gathered by Swainson near Rio de Janeiro, according to Hooker (Musc. Exot. t. 128). Hooker's Herbarium, however, affords reason for the belief that the original locality was Bahia. The African plant appears to differ from the Brazilian as redescribed by C. Mueller (Synops. I. p. 761) in the lighter colour (yellowish brown), more laciniate base and less rough (merely scabrous) apex of the calypters.

12. **MACROMITRIUM** Brid. Mant. Musc. p. 132 (1819).

1. **M. tenue** Brid. Bryol. Univ. I. p. 740.

*Orthotrichum tenue* Hook. et Grev. in Brewster's Edinburgh Journ. I. p. 120, t. v. (1824).

PUNGO ANDONGO.—A blackish-green, densely cæspitose moss, closely enveloping the upper branches of *Xerophyta squarrosa* Baker, Hb. Welw. No. 1555 ; common, but very seldom producing fruit owing to the exposed situation it occupies on unsheltered rocks in the fierce heat of the sun ; Pedra de Cansambe, within the præsidium ; with fr. in very small quantity, 3 May 1857. No. 53. A few specimens found on a half-dry branch which had fallen from an old tree in the primitive wood called Mata de Pungo, within the præsidium ; with fr. beginning of June 1857. No. 86.

2. **M. lycopodioides** Schwaegr. Spec. Musc. Suppl. II. ii. p. 141, t. 193 (1827).

*Orthotrichum lycopodioides* Burchell, Catalog. Geogr. Plant. Afr. Austr. Extratrop. ms. No. 5144-47.

HUILLA.—Very common ; growing with *Braunia arbuscula* (No. 32) on old trunks which are bearded with *Usnea* and *Physcia* on the summit of Serra da Xella, where Welwitsch often saw it bearing fruit on a species of *Tarchonanthus* and other trees : gathered in a very dry and fragile state with fr. June 1860. No. 19. (The British Museum specimen has no fruit). A very dry and brittle moss with a conical straightly rostrate operculum and hardly any peristome except a very short white membrane ; mingled in tufts of *Braunia arbuscula* (No. 32), but much more slender than that plant ; in company with various Lichens on branches of old trees on the highest parts of Serra da Xella at an elevation of about 4000 ft. ; with fr. June 1860. No. 198.

GOLUNGO ALTO.—Growing with *Erythrodontium* on old trunks, especially of *Edwardia lurida*, in rocky woody parts of Sobato de Quilombo-Quiacatubia ; with fr. July 1856. No. 144.

13. **EPHEMERUM** Hampe in Flora XX. p. 285 (1837).

1. **E. æthiopicum** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 443. t. iii. fig. 8 (1872).

GOLUNGO ALTO.—Cæspitose, yellowish green, springing from a basal weft of confervoid protonematosus filaments ; theca subsessile, turning red at maturity ; on clayey sandy soil by the roadside between Sange and Bango ; with fr. Dec. 1855. No. 155.

14. **FUNARIA** Schreb. Gen. Plant. p. 760 (1791).1. **F. hygrometrica** Hedw. Sp. Muse. p. 172 (1801).

ISLAND OF ST. THOMAS.—Laxly cespitose, growing with various Bryoid mosses and occurring principally on half-burnt, half-rotten trunks in woods on Monte Caffé at an elevation of about 2500 ft.; with fr. Dec. 1856. No. 127.

Also collected in woods in the kingdom of Lunda to the east of the district of Casange and given to Welwitsch by Livingstone, May 1855. No. 115.

15. **PHILONOTIS** Brid. Bry. Univ. II. p. 15 (1827).**P. spongiosa.**

*Bryum spongiosum* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 218, t. i. fig. 3 (1871).

*Anomobryum spongiosum* Jaeg. Gen. et Spec. Muse. I. p. 603.

PUNGO ANDONGO.—A densely cespitose, brilliantly green moss occurring in spongy pulvinate tufts on wet gneiss rocks; frequently visited by Welwitsch, but always found in the sterile state; at the cataracts above Calunda in the most lofty parts of the præsidium, Oct. 1856; by rills in Mata de Pungo, Nov. 1856, and Feb., April and middle of May 1857; near Cabondo, Jan., Feb., March 1857; by the springs of Pedra Cabondo, Dec. 1856, Feb. and May 1857; by the cataracts of the præsidium, March 1857. No. 61. Closely associated with *Bryum argenteum* (No. 70) on wet rocks by the rivulet in Barranco de S. Antonio within the præsidium, always sterile, May 1857. No. 62. Also Alga No. 152.

The stems of this moss are usually branched at base, bearing long (2 cm.) simple branches which are straight or curved at apex, and tomentose below; leaves congested at apex: the mature leaves exceed 1 mm. in length and are slightly papillate on the upper surface: the nerve is shortly excurrent at apex and decurrent at base, and the margin is narrowly revolute along the whole of one side and in the middle of the other side: the basal cells near the nerve are large and lax and those near the margin are shorter, quadrate and sub-oblanceolate; the upper cells are lax and the contracted primordial utricle in them is persistent; inflorescence not observed.

Some of the specimens under Welwitsch's No. 61 may turn out to belong to another species, with stems more branched, less tomentose.

Among the indeterminate specimens belonging to this genus are the following numbers:—

HUILLA. On the roots of old trees and on rocks close by, near rivulets in rather dense woods, near Catumba: sterile, April 1856. No. 29, in part.

PUNGO ANDONGO.—On rocks by rivulets in forests of *Cesalpiniae* and *Acaciæ*, near Pedras de Guinga: sterile, Jan. 1857. No. 57. Very bright green, widely cespitose, providing a suitable basis for the growth of terrestrial *Utriculariae*: on the sides of the Casalalé river within the præsidium: sterile, March 1857. No. 79.

GOLUNGO ALTO.—On shaded moist ground by the rivulet of Quibolo; sterile, 19 March 1856. No. 156. A moss never found in the fruiting state though visited at different periods: on the margins of the ferruginous spring near Bango-Aquitamba, end of April and in Nov. 1856. No. 182. On rocks covered with a spongy crust of sandy mud alongside the springs near Sange: sterile, Feb. 1855. No. 188.

16. **BRACHYMENTIUM** Hook. ex Schwaegr. Spec. Musc. Suppl. II. i. p. 131 (1824).

1. **B. angolense** Jaeg. Gen. et Spec. Musc. I. p. 579 (1875).

*Bryum (Brachymenium) angolense* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 219, t. i. fig. 4 (1871).

**HUILLA.**—A widely cespitose moss; stems very densely woven together by an abundance of dark red fibrils; leaves imbricate, piliferous at apex; capsule elliptic, dark red, borne on a straight straw-coloured seta; operculum obtusely conic, shortly mamillate; on rather old trunks of a Sapotaceous tree called by the negroes "Mutambote" (*Chrysophyllum argyrophyllum*) on the way from Morro de Lopollo towards Nene, at an elevation of 5300 ft.; with fr. at end of March 1860. No. 26. On the base of old trunks in forests, near Lopollo, without fr. May 1860. No. 37.

2. **B. Welwitschii** Jaeg. Gen. et Spec. Musc. I. p. 581 (1875).

*Bryum (Brachymenium) Welwitschii* Duby in Genève, Mém. Soc. Phys. XXI. i. p. 219, t. ii. fig. 3 (1871).

**PUNGO ANDONGO.**—A flavo-virescent, widely cespitose moss of splachnoid habit, growing in elevated rocky bogs; very rare and noticed by Welwitsch in one spot only, in Barranco de Catete; with fr. May 1857. No. 56.

17. **BRYUM** Dill.; Br., Sch. et Guemb. Bry. Eur. IV. (1836-51).

1. **B. coronatum** Schwaegr. Sp. Musc. Suppl. I. ii. p. 103 (1816).

**HUILLA.**—By no means common in the shortly grassy pastures of Empalanca, flooded in the rainy season, at an elevation of about 5600 ft., on the Huilla plateau; with fr. May 1860. No. 24. Near Lopollo, April 1860. No. 7b.

**PUNGO ANDONGO.**—Common, but sparingly with fruit, in rifts of the higher rocks of Pedras de Guinga; March 1857. No. 59. By the great cataract of the Cuanza River near Condo; with unripe fr. March 1857. No. 206.

**ISLAND OF ST. THOMAS.**—A luxuriant form occurring on fallen half-burnt half-rotten trunks in woods at an elevation of 2500 ft. in the locality called "Monte Caffé," growing with a sterile species of *Orthodontium*; with fr. Dec. 1860. No. 126.

Also gathered at Freetown in Sierra Leone by Vogel.

2. **B. argenteum** Linn. Sp. Plant. p. 1120 (1753).

**PUNGO ANDONGO.**—In wide tufts on volcanic rocks near Cabondo within the præsidium; with fr. end of Feb. 1857. Nos. 70 and 70b.

3. **B. squarripilum** C.M. in Flora LXIX. p. 280 (1886).

**PUNGO ANDONGO.**—In rifts of rocks at an elevation of about 4000 ft., Serra de Pedras de Guinga; with immature fr. Jan. 1857. No. 63. On rocks near the base of Pedra Cabonda within the præsidium, not uncommon but sparingly with fr.; Dec. 1856. No. 71.

**HUILLA.**—Among thickets in clayey-sandy wooded pastures near Mumpulla; end of Oct. 1859. No. 7.

This species bears the name of *B. argenteum* var. *nervosum* Welw. et Duby. It answers closely to C. Müller's description of *B. (Argyrohrygium) squarripilum*, which was gathered in St. Thomas's Island by Moller.

4. **B. cæspiticium** L. Sp. Pl. p. 1121 (1753).

**LUNDA.**—Gathered in the kingdom of Lunda, at a distance of about

380 geographical miles from the west coast, by David Livingstone : with fr. May 1855. No. 118.

In our specimens, which much resemble this widely distributed species, the capsule and seta are blood-red in colour ; the leaves are less narrowly acuminate than in the type ; the nerve, arista and margin are yellow ; the contracted primordial utricle of the laminar cells is densely maculato-chlorophyllose.

Two other specimens, referred to this species by Duby, approach more nearly to *Bryum alpinum* in the shape of their leaves ; but in other respects they differ from it, and they are both sterile. Their numbers are as follows :

HUILLA. In elevated boggy wooded places by streams in Morro de Monino, common enough but sterile ; Dec. 1859 and Feb. 1860. No. 25. On roots of old trees and on rocks by streams in rather dense woods near Catumba ; April 1860. No. 29, in part.

5. *B. viridescens* Welw. et Duby in Genève, Mém. Soc. Phys. XXI, i, p. 218, t. ii, fig. 2 (1871).

HUILLA.—In shortly bushy pastures, flooded in summer, between Empalanea and Nene, at an elevation of 5000 to 5200 ft., but at the time of gathering (May) very scanty or cropped by cattle, etc. : with fr. in small quantity May 1860. No. 28.

The conal leaves are elliptical, with the upper part of the margin denticulate and not convolute ; the margin near the base is narrowly revolute ; the nerve and arista are yellow : the densely chlorophyllose contracted primordial utricle occupies the long diameter of the cells. Welwitsch notes that the capsule is viridescent or at length here and there brick-red.

6. *B. huillense* Welw. et Duby in Genève, Mém. Soc. Phys. XXI, i, p. 220, t. i, fig. 5 (1871).

*Brachymenium huillense* Jaeg. Gen. et Spec. Musc. i, p. 572 (1875).

HUILLA.—A cespitose moss of Mnoid habit, with proliferous stems ; rather rare on the base of old trunks in damp woods by the Monino brook, but only in the more elevated rocky stations, and never seen in fruit by Welwitsch : April and May 1860. No. 4.

The leaves are 4 mm. long, with margins revolute from base almost to apex : the primordial utricle of the cells is contracted and densely chlorophyllose ; the marginal cells are long, thick-walled, yellow, but do not form a thickened limb.

The indeterminate specimens of various subgenera of *Bryum* are as follows :—

HUILLA. A *Webra* mingled with Hepaticæ at an elevation of 5400 ft. in rugged parts of Morro de Monino : April 1860. No. 30. A few little tufts of a *Webra* found among ferns in rugged places at the spot called by the natives "Ferrão da Sola," by the cataract near Lopollo ; with poor fr. Jan. 1860. No. 44. In congested dark green tufts forming wide patches on the ground in woody places on the way from Lake Ivantida towards Quilengues ; sterile, Feb. 1860. No. 41.

PUNGO ANDONGO. —On moist rocks in the more elevated parts of Barranco de S. Antonio within the præsidium ; without fr. May 1857. No. 52. A glistening green *Rhodobryum*, widely but laxly cespitose, common on the rich soil covering the shaded rocks of Mata de Pungo ; sterile, middle of May 1857 ; and by cataracts in the woods in Valle de Cabondo ; sterile, Dec. 1856. No. 55. Intensely green, widely cespitose by the spring of "Cazella" within the præsidium at

an elevation of 3000 to 3200 ft. ; sterile, Sept. 1856 ; but later on utterly destroyed at the cleaning of the spring soon after Welwitsch's arrival in Pungo Andongo. No. 65. Widely cespitose in grottoes of moist rock at the foot of Serra de Pedras de Guinga ; sterile, Jan. 1857. No. 82. Poor specimens yellowish green, densely pulvinate, on shaded ground by the great cataract of the river Cuanza near Condo ; without mature fr. March 1857. No. 83.

**GOLUNGO ALTO.**—A moss rarely noticed, of a pleasant very green colour, in company with other mosses, widely but laxly cespitose in shortly grassy places on the banks of the Moio (Múia) stream, to the right as one ascends to Quilombo-Quiacatubia ; with female inflorescence 16 July 1856. No. 181.

**MOSSAMEDES.**—The only species of moss observed by Welwitsch in the littoral region between 14° and 16° S. lat. ; on the muddy-sandy banks of the nearly dried up river Bero or Rio das Mortes at sea level near Cavalheiros ; in small quantity and without fr. June 1859. No. 1.

#### 18. **POGONATUM** Pal.-Beauv. Prodr. p. 39 (1805).

##### 1. **P. angolense** Jaeg. Gen. et Spec. Musc. I. p. 713 (1875).

*Polytrichum (Pogonatum) angolense* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 217 (1871). *P. (Pogonatum) huillense* Welw. et Duby, *op. cit.*, tab. i., fig. 2.

**HUILLA.**—A Polytrichoid moss of gregarious growth, allied in habit and characters to *P. brachyphyllum* Pal.-Beauv. and various European species : very rare, seen by Welwitsch in only one place, in elevated shortly bushy pastures in the plateau de Empalanca ; with fr. April 1860. No. 18.

#### 19. **POLYTRICHUM** Dill. ; Br., Sch. et Guemb. Bry. Eur. IV. (1836-51).

##### 1. **P. commune** L. Sp. Pl. p. 1109 (1753).

**PUNGO ANDONGO.**—Common on the higher rocks of the præsidium by the cataracts of the streams near Cabondo, but apparently very seldom bearing fruit ; always without fr. Dec. 1856, Jan., Feb. and April 1857. No. 49.

**HUILLA.**—A very fine moss, glaucous-green, laxly and widely cespitose, commonest of African Polytrichums ; in the rather shady rocky elevated thickets of Morro de Lopollo, in company with Proteæ, Melastomaceæ and Utriculariæ : without fr. Feb. 1860. No. 16. In rocky places, growing with *Blæria Bugomii* Engl. (Herb. Welw. No. 2559), by the road from Morro de Empalanca towards Nene ; without fr. May 1860. No. 15. In very rugged rather moist places from Morro de Lopollo towards Humpata, at an elevation of 3400 ft. ; with inflorescence, end of May 1860 : and at an elevation of 5500 ft., at Morro de Lopollo ; with inflorescence March 1860. No. 14. In elevated pastures, flooded during the rainy season, and chiefly occupied by Cyperaceæ, Eriocauloneæ and Xyridæ, at Empalanca and Nene ; with fr. end of April 1860. No. 17.

##### 2. **P. elegans** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 217, t. ii. fig. 1 (1871).

**PUNGO ANDONGO.**—Laxly cespitose,  $\frac{1}{2}$  to 1 ft. high, usually in company with and mixed with other mosses ; common on rocks and in bushy places behind Mata do Pungo ; without fr. from Oct. 1856 to May 1857. No. 50.

20. **FISSIDENS** Hedw. Fund. Muse. ii. p. 91 (1782).

1. **F. angolensis** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 225, t. iv, fig. 6 (1871).

GOLUNGO ALTO.—On clay soil close to the left bank of the Cmango stream near Sange; with fr. Dec. 1855. No. 138. On schistose rocks, Monte de Queta; with fr. March 1856. No. 138<sup>b</sup>. At the spring of Capopa near Sange, growing on rocks of mica-schist; with but little fr. Dec. 1855. No. 138<sup>c</sup>. Among mosses (*Racopilum tomentosum*, etc.) by the banks of the Cmango stream; with fr. June 1856. No. 196. Terras de Bumba; with ripe fr. June 1856. No. 334.

PUNGO ANDONGO.—In tufts of *Lejeunea* on moist ground, also on rotting trunks, in Barranco de Songne; with fr. middle of May 1857. No. 113<sup>b</sup>.

CAZENGO.—On muddy ferruginous soil, at an elevation of 2000 ft., in the mountains of Serra de Muxailla by the rivulet of the same name; with old or fallen fr. Jan. 1855. No. 184.

The *laminæ vera* of the upper leaves of fruiting specimens of this species is partly marginate.

2. **F. dasyphus** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 224, t. iv, fig. 2 (1871).

GOLUNGO ALTO.—Very frequent by the sides of roads and steep mountain-sides, everywhere in wooded places throughout the district, at an elevation of 2000 to 2200 ft., Caminho de Bumba; with scanty fr. Jan. 1856. No. 137.

3. **F. Welwitschii** Duby in Genève, Mém. Soc. Phys. XXI. i. p. 223, t. ii, fig. 5 (1871).

PUNGO ANDONGO.—A rather elegant species, found once on dead half-rotten branches of *Vellasia*, and afterwards sought in vain; on the more elevated rocks on the westward side of the præsidium; with scanty fr. end of April 1857. No. 113.

4. **F. glaucissimus** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 223, t. iii, fig. 4 (1871).

GOLUNGO ALTO.—Not infrequent in the grottoes of Sobato de Quilombo Quiacatubia; with fr. July 1855. No. 139. On rocks near Quilombo Quiacatubia; with fr. July 1856. No. 140. In grottoes of schistose rocks in the primitive woods of Monte de Queta, by the banks of the river Luiinha, at an elevation of about 1900 ft.; with fr. during the cold July of 1856. No. 142. Val da Cedrela; with fr. July 1856. No. 336. Also Alga No. 142.

CAZENGO.—Interwoven with No. 186 (*Anacampthodium fabronioides*), Serra de Muchatula, at an elevation of 2000 ft., three specimens, one with fr. Jan. 1855. No. 201.

To this species belongs *Fissidens Zenkeri* Broth. MS. in Zenker et Staadt's Muse. Exsicc. No. 570, from Yaunde Station, Kamerun.

Var.  $\beta$  minor Welw. et Duby, *l.c.*, p. 224.

GOLUNGO ALTO.—With a few opercula and calyptas; seen by Welwitsch in but one place, on mossy rocks in company with tree-ferns (*Alsophila aethiopica* Welw.) alongside the streams of Quisneula; with fr. July 1857. No. 141.

5. **F. longipes** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 224, t. iv, fig. 3 (1871).

PUNGO ANDONGO.—Tufts 1 to 3 ft. in diameter, indeed covering the whole vertical face of a great rock, but lax and fragile ; at the base of the gigantic rocks of Cabonda ; with fr. middle of Jan. and middle of March 1857. No. 69.

6. **F. Dubyanus** Jaeg. Gen. et Spec. Musc. p. 23 (1876).

*F. macrophyllus* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. i. p. 223 t. iii. fig. 3 (1871).

GOLUNGO ALTO.—On very shaded clayey soil in road-cuttings between Bango and Bumba ; with unripe fr. Jan. 1856. No. 136.

To the present genus belong the following numbers :—

PUNGO ANDONGO.—In company with *Octoblepharum albidum*, rather sparingly on wet rocks by rivulets in Barranco de Pedra Songue, originally with an old theca or two, now lost ; middle of May 1857. No. 68. On spongy-wet mossy ground, sparingly interwoven with other mosses ; Barrancos de Catete ; with fr. middle of May 1857. No. 202. Imperfect specimens of two species growing with *Hookeria angolensis* (No. 108) on moist ground shaded by *Cyathea angolensis* alongside rivulets and springs in Barranco da Pedra de S. Antonio ; middle of May 1857. No. 109.

21. **OCTODICERAS** Brid. Musc. Recent. Suppl. III. i. p. 162 (1806).

1. **O. capense** Jaeg. et Sauerb. Gen. et Spec. Musc. II. p. 51 (1876).

*Conomitrium capense* C. Muell. Synops. II. p. 524 (1851).

BUMBO.—Plentiful in very cold rivulets and springs at Arreial de Caionda, and observed elsewhere throughout this region : on the highest peaks of Serra da Xella, and gathered in a nice state of fruit in the Fonte de Caionda at an elevation of 4000 ft. ; Oct. 1859, also June 1860. No. 2.

MOSSAMEDES.—In rivulets, Serra da Xella : with fr. Oct. 1859. No. 335.

Welwitsch paid much attention to this species. He considered that it differs from *O. Julianum*, which is common in Portugal, only in its somewhat more acute leaves, with nerve usually vanishing at two-thirds the leaf's length and not just below the apex, and in its rather larger capsule. The Africane plant has its older stems compressed, almost complanate, nigrescent. He observed the operculum of several capsules to be not conical but depresso-hemispherical, its rostrum becoming more equally cylindrical and not conical at the base ; but after examining more than twenty capsules in different stages of ripening, he was constrained to modify his view as to this variation of form or proportion, the normal operculum being formed almost or indeed exactly as in *O. Julianum*.

22. **RACOPILUM** Pal.-Beauv. Prod. p. 36 (1805).

*Rhacopilum* C. Muell. et aliorum.

1. **R. tomentosum** Brid. Bry. Univ. II. p. 719 (1827).

*Hypnum tomentosum* Sw. Prod. p. 141 (1788) ; Hedw. Musc. Frond. iv. p. 48. t. 19 (1791). *H. mucronatum* Pal.-Beauv. Prod. p. 66 (1805).

GOLUNGO ALTO.—Growing in company with Hepaticas on rocks by the banks of the Cuango stream, but in this situation seldom bearing fruit ; with fr. June 1856. No. 165. On trunks of old trees by the

Catcombe rill on the Queta mountains ; with fr. middle of June 1857. No. 166.

CAZENGO.—Among Hepaticas on old trunks, Serra de Murxauña ; with fr. June 1858. No. 199.

2. **R. africanum** Mitt. in Journ. Linn. Soc. VII. p. 162 (1864).

PUNGO ANDONGO.—Frequent by shaded springs on the elevated rocks of Pedra Cazella ; with scanty fr. beginning of May 1857. No. 60. At the base of old tree-trunks and on moist ground in wooded places near Catete, frequent but sterile ; Barranco de Catete ; without fr. Dec. 1856. No. 96.

GOLINGO ALTO.—On the bark of old trees and on rocks in the vicinity, near Quilombo-Quiacatubia ; with fr. March 1855. No. 150.

To this genus the following numbers belong :—

GOLINGO ALTO.—On half-dried mud on the banks of the Cuango stream (also occurring on lime-kilns), very seldom with fr. ; middle of June 1856. No. 149. By the Cuango : Feb. 1856. No. 212, in part. On the bark of the tree "Musubiri" (*Myrianthus arboreus*), Queta (Zengas) ; March 1856. No. 213.

CAZENGO.—On rocks usually inundated along the banks of the Luinha river, at an elevation of about 1800 ft. ; without fr. Jan. 1855. No. 183.

23. **BRAUNIA** Br. et Sch. Bry. Eur. III. (1836-51).

1. **B. diaphana** Jaeg. Gen. et Spec. Musc. II. p. 88 (1876).

*Neckera diaphana* C. Muell. Synops. II. p. 105 (1851). *Leucodon sekistos* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 427 (1872).

HUILLA.—On the older trunks, especially of *Tarchonanthus* and *Xeropetalum*, on the summit of Serra de Xella ; with old fr. June 1860. No. 31. On rocks and trunks on the summits of the mountains of Mumpulla ; without fr. Oct. 1859. No. 33.

Our specimens appear to differ from the type only by the longer seta, which is 8 to 10 mm. in length.

2. **B. arbuseula**.

*Leucodon arbuseula* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 427, t. i. fig. 4 (1872).

HUILLA.—Frequent on the older trunks and branches of *Tarchonanthus* and various other trees in rocky parts of the high peaks of Serra de Xella and towards Mumpulla ; at an elevation of 4000 ft. in company with *Macromitrium lycopodioides* and *Physciella leucomela* ; with fr. June 1860. No. 32.

Our specimens of this plant approach *B. Schimperiaria* Br. et Sch., but are abundantly distinct in the following characters. Leaves from an erecto-patent base recurved so as to become horizontal ; not imbricate ; apices of the older leaves hyaline ; capsules longly elliptical (not cylindric), irregularly plicate, with mouth rather contracted ; cells of the capsule brown, distinct (not yellow, inconspicuous, as in *B. Schimperiaria*).

24. **CRYPHÆA** Weber, Tab. Exhib. Calypr. Operc. (1813) ; Brid. Mant. Musc. p. 139 (1819).

1. **C. Welwitschii** Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 426, t. ii. fig. 1 (1872).

GOLUNGO ALTO.—A rather rigid, deep green, viviparo-ramulose moss of cæspitose growth, completely enveloping virgate branches of trees near the margin of very elevated primitive woods. On *Coffea* and *Diospyraceous* trees in the woods of Cungulungulo, at an elevation of 2400 ft.; with fr. Feb. 1855. No. 128; also No. 211, in part.

25. **PILOTRICHELLA** Jaeg. et Sauerb. Gen. et Spec. Musc. II. p. 158 (1877).

1. **P. Welwitschii.**

*Neckera (Meteorium) Welwitschii* Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 428. t. iii. fig. 2 (1872).

GOLUNGO ALTO.—A very fine moss, pendulous on branches of various trees, of many colours, now deep green, now golden-flavescens, now almost like bright copper; never found in fruit by Welwitsch; in dense primitive woods, where *Coffea arabica* is frequent, at an elevation of 2400 ft., on the mountains of Cungulungulo; Feb. 1855. No. 145, also No. 211, in part.

CAZENGO.—Longly pendent from branches of trees, propagating itself abundantly, but not found in fruit, though diligently sought, by Welwitsch; in shady moist elevated places on the mountain of Muxaúlo; June 1855. No. 145.

Both of our tickets are placed under the same number, and the specimens are mixed. These latter belong to the section *Orthostichella*, and in habit rather resemble *P. rividis* Jaeg. Gen. et Spec. II., p. 162, but the ramuline leaves are spathulate from a contracted base, obsoletely binervate, more longly acuminate, with upper margins involute and serrulate. The leaves are pentastichously arranged; and those of the primary branches are nearly twice as long as the ramuline, and bear an elongated subulate flexuose acumen about 0·6 mm. in length.

26. **PAPILLARIA** Jaeg. et Sauerb. Gen. et Spec. Musc. II. p. 167 (1877).

1. **P. vaginans.**

*Neckera (Meteorium) vaginans* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 428. t. iii. fig. 1 (1872).

GOLUNGO ALTO.—Almost always mixed with other mosses, *Frullania*, etc., on trees and more rarely on rocks close by; frequent upon trunks of *Coffea arabica* in the *Coffea* forests at an elevation of 2800 to 3000 ft. on the mountains of Cungulungulo; without fr. Feb. 1855. No. 161.

Our specimens belong to the section *Floribundaria* and resemble *Papillaria floribunda* C. Muell. (in Linnæa XL. (1876) p. 267) in habit, but the leaves are squarrosa-recurved, ovate acuminate from a cordate base, upper margins more markedly serrate. The cells are seriatately 3- to 4-papillate.

2. **P. africana** Jaeg. et Sauerb. Gen. et Spec. Musc. II. p. 176 (1877).

*Neckera africana* C. Muell. Synops. ii. p. 137 (1851).

GOLUNGO ALTO.—More or less longly pendulous, on branches of indigenous *Coffea arabica* and other trees in the primitive woods on the summit of Cungulungulo mountain; without fr. Feb. 1855. No. 160.

27. **CALYPTOTHECIUM** Mitt. in Journ. Linn. Soc. x. p. 190 (1869).

1. **C. golungense** Gepp. sp. n.

Sterile. Secondary stems 5 to 10 cm. long, densely or laxly pinnate or divided into two or three pinnate branches, yellowish green at apex, scarcely shining, dull and lutescent with age and soon decaying; pinnae 0.5 to 1.2 cm. long, obtuse at apex, occasionally longer and attenuate at apex; leaves 2.2 to 2.4 mm. long, 0.9 mm. wide near base, complanate, rugulose when dry, from a wider auriculato-cordate base ovate then ligulate (0.45 mm. wide), acute, shortly acuminate, either symmetrical and slightly hollowed, or concave on one side; margins flexuose especially near base, entire or obsoletely serrulate below, serrulate near apex; nerve slender reaching or surpassing the middle of the leaf; cells pellucid linear vermicular, becoming elliptic and rhomboid obscure in the auricles and lax quadrate, brown with age, at the basal angles; cell-walls firm yellow indistinctly porose.

This species is probably closely allied to *Neckera acutifolia* Brid., as described by Bescherelle in Ann. Sci. Nat. ser. 6, t. x. p. 273 (1880), and still more to *Calyptothecium subacutifolium* Broth. in Engl. Bot. Jahrb. xxiv. ii. p. 254 (1897); but appears to differ from the latter in the lighter colour of the plant and in the less hollow more auriculate leaves, and from the former in the smaller size of the plant and the dull surface and different shape of the leaves. The firm yellow cell-walls distinguish our plants from such allies as *Neckera Moritzii* C. Muell. and *Pterobryum duplicatum* Mitt., in which the cell-walls of the leaves are thicker, cartilaginous and distinctly porose.

GOLUNGO ALTO.—On old trunks and rocks in the vicinity alongside brooks in the primitive forests of Zengas do Alto Queta and Mata de Quisueula; without fr. Feb. and July 1856. No. 147.

## 28. POROTRICHUM Doz. et Molk. Bry. Jav. ii. p. 69 (1862).

1. *P. lopidiooides* C. Muell. in Dusén, Musei Africani Camerun. exsicc. No. 469 (1893). Paris, Index Bryolog. iv. p. 1015 (1898).

*Hypnum (Thamnium) africanum* Welw. et Dub. in Genève, Mém. Soc. Phys. XXI ii. p. 436, t. iii. fig. 4 (1872). *Thamnium africanum* Jaeg. Gen. et Spec. Muse. II. p. 216 (1877). *Thuidium filiforme* Welw. et Dub. in Genève, Mém. Soc. Phys. XXI. ii. p. 436, t. iii. fig. 4 (*Thuidium filiforme*), (1872).

GOLUNGO ALTO.—In a dense mass on rocks and tree-trunks by the Quarengue stream on the Queta mountains; without fr. April 1856. No. 148. A widely cespitose pendulous, dendrophilous moss, on trunks of trees ("Dizanha," *Tricalia africana*) in the shadiest parts of the mountains of eastern Queta; without fr. middle of June 1857. No. 148b. In company with *Cryphaea* and other mosses on trunks and thicker branches of trees on the summit of Cungulungulo; without fr. Feb. 1855. No. 168. Mixed with tufts of *Racopilum tomentosum* (No. 166) on bark in the woods of Alto Queta alongside the Catombe brook; without fr. and in small quantity end of June, July 1857. No. 169. Also Alga No. 138.

ST. THOMAS'S ISLAND.—Growing with *P. Quintasi* on bark at the foot of trunks in dense woods at an elevation of 2500 ft., at Novo Destino; without fr. Dec. 1860. No. 124.

Our plants are sterile and mostly small and imperfect.

2. **P. Quintasi** Broth. in Bol. Soc. Brot. viii. p. 181 (1890).

ST. THOMAS'S ISLAND.—A small quantity growing with *P. lopidiooides* on bark at the foot of trunks in dense woods at an elevation of 2500 ft. at Novo Destino : without fr. Dec. 1860. No. 124, in part.

3. **P. elongatum**.

*Homalia elongata* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 429. t. ii. fig. 3 (1872).

GOLUNGO ALTO.—Living on old tree-trunks and rocks in the vicinity in the primitive woods of Quisueula near Bango : without fr. Feb. 1855. No. 146. In company with other mosses, especially with tufts of *Racopilum*, on rather young trunks in the woods of Catombe, Serra de Alto Queta ; without fr. June 1857. No. 167. With *Thuidium gratum* on the older trunks in the elevated primitive woods of Serra de Alto Queta, at an elevation of 2200 ft. : without fr. Jan. 1856. No. 143, in part. On dead branches near Zengas do Queta (Sange) : with fr. July 1857. No. 146b.

Our specimens appear to belong to *Anastrephidium*, a section of *Porotrichum*.

29. **THAMNIUM** Schimp. in Br., Sch. et Guemb. Bry. Eur. V. (1851-55).

1. **T. variifolium**.

*Homalia variifolia* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 429. t. iv. fig. 5 (1872).

PUNGO ANDONGO.—In company with *Lepidopilum angolense* on moist rocks by rivulets in Mata de Pungo : without fr. May 1857. No. 88. On rocks by the Casalalé rivulet within the præsidium at an elevation of 3200 ft. : without fr. Feb. 1857. No. 89. Also Alga No. 141.

GOLUNGO ALTO.—Of a very fine green colour, sometimes without flagellæ, sometimes exceedingly flagelliferous : on old trunks and on the ground (humus) in the shadiest parts of the primitive woods of Mata de Quisueula at an elevation of 2400 ft. ; without fr. Jan., July and Sept. 1855, Feb. 1856. No. 159.

Our specimens are very closely allied to *Thamnium Hildebrandtii* Jaeg. et Sauerb., of which *Porotrichum pterops* Rehm. (Musc. Austro-Afric. nos. 329 (*Neckeria*), 621 and 621b) appears to be a synonym.

30. **HOOKERIA** Smith in Trans. Linn. Soc. ix. p. 275 (1808).

1. **H. huillensis** Gepp. sp. n.

Sterile. Laxly cespitose. Plants lurid-brown below, glaucous-green above, yellowish at apex. Stems 3 cm. long, vaguely branched ; branches 6 to 8 mm. long, and with the foliage 3.5 to 4 mm. wide ; leaves variously curved, unaltered when dry, easily moistened ; lateral leaves 2 mm. long, 0.75 mm. wide, ovato-ligulate subacute suddenly cuspidato-acuminate, with margins serrulate above the middle and limbate to the apex with a sublutescent biserrate limb, with nerves  $\frac{3}{4}$  the length of the leaf, dorsally serrulate and prominent at their apices, with upper cells lax 0.045 mm. diam. rotundato-hexagonal and pseudo-incrassate with chlorophyll, and lower cells oblong ; median leaves 1.5 by 0.6 mm. lanceolate-acuminate subentire, with nerves smooth evanescent about the middle of leaf, and cells longer.

This species is allied perhaps to *H. (Euhookeria) Preussii* described by Brotherus in Engler's Botan. Jahrb. xx. p. 201 (1894), and is distinct from it in having wider branches, longer and more easily moistened leaves and probably larger areolation. It is a larger plant than *H. Breutelianum* Hampe, and its leaves are not half as wide as those of *H. Vallis-gratia* Hampe.

**HUILLA.**—A moss with leaves remarkably glaucous and rather fleshy in the living state: rather rarely occurring on the ground by oldish tree-trunks, in company with *Utriculariae* and *Xyridace*, etc., in the spongy swamps on Morro de Monino at an elevation of 5400 ft.; without fr. April 1860. No. 39.

2. ***H. angolensis* Welw. et Duby** in Genève, Mém. Soc. Phys. XXI. ii. p. 112, t. v, fig. 5 (1872).

*Lepidopilum angolense* Jaeg. Gen. et Spec. Musc. ii. p. 231 (1877).

**PUNGO ANDONGO.**—A very pretty terrestrial moss, occurring on the shaded sides of springs and rivulets in almost entirely rocky places at a considerable elevation: but only in the Barranco de Pedra de S. Antonio did Welwitsch gather it in a fruiting state, and that was on mossy ground shaded by *Cyathea angolensis* and rarely conspicuous: with fr. May 1857. No. 108.

**GOLONGO ALTO.**—Apparently a rare and sporadic moss, occurring among Hepaticæ at the foot of tree-trunks very scantily in the primitive woods of Quisneula near Bango-Aquitamba; with poor fr. June 1856. No. 193.

3. ***H. contracta* Gepp, sp. n.**

Monoicous; green, dilute at apex; yellowish at base. Branches adscending, simple or laxly and irregularly pinnate, 2·5 to 7·0 cm. long, complanate, with the foliage 3·5 mm. wide; branchlets 0·6 to 1·2 cm. long, obtuse. Lateral leaves reflexo-patulous, contracted, unaltered when wet, variously flexed, asymmetrical, 2·0 mm. long by 0·6 wide, oblongo-lanceolate, acuminate; margins elimate, more or less infolded on one side and with a small auricle at the base of the other (convex) side, strongly serrate above the middle, with the subapical serrations geminate; nerves two, short, vanishing below the middle; cells elongated (5 by 1), contracted, densely chlorophyllose, with pellucid walls. Median leaves shorter. Perichaetial bracts smaller, more narrowly acuminate, less strongly serrate, with subapical serrations geminate. Seta 17 mm. long, smooth, red; theca (unique, damaged) inclined, oval?, with neck scaberulous,  $\frac{2}{3}$  as long; operculum rostrate,  $\frac{1}{3}$  as long.

This plant is readily distinguished from *H. angolensis* Welw. et Duby by the less crowded, less imbricate, more flexuous, more sharply acuminate leaves, the cells of which are contracted and obscured by chlorophyll. In the apical leaves only do the cells, when moistened, expand and become hexagonal and pellucid.

**PUNGO ANDONGO.** On shaded ground in the forest called "Mata de Pungo"; in small quantity and almost without fr. May 1857. No. 80.

*H. angolensis* and *H. contracta* present at first sight the appearance of a *Lepidopilum*, but differ from that genus by having a Hookeriaceous peristome and a long smooth seta and leaves with abbreviated apical

cells and geminate apical teeth. They belong to that section of the genus *Hookeria* which Hampe has called *Lamprophyllum*, in Kjöbenhavn Vidensk. Meddel. 1874, 9, p. 158. Other species which belong to this section are *H. Puppeana* Hampe, *H. macrophyxis* Rehm. (Musc. Austro-Afric. nos. 339, 623), *H. utacamundiana* Mont., *H. secunda* Griff., *H. macropus* Doz. et Molk., *H. nitens* Hornsch., *H. Glaziorii* Hampe, *H. breviseta* Hampe, and probably *Lepidopilum dererum* Mitt.

31. **FABRONIA** Raddi in Att. d. Accad. d. Scienz. di Siena ix. p. 231 (1808).

1. **F. angolensis** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 425. t. i. fig. 3 (1872).

**PUNGO ANDONGO.**—A moss of a most beautiful green colour during life, but turning pale when dried. Common on the aerial roots of *Hariota parasitica* on the highest western rocks of the præsidium at an elevation of about 3800 to 4000 ft. on Pedra Cabonda, also on lichenous ground : with ripe fr., and occasionally young calyptas, towards the end of May 1857. No. 72.

Var. **acuminata** Gepp. var. nov.

Leaves acuminate not piliform-acuminate.

**PUNGO ANDONGO.**—A small whitish-green moss, widely cæspitose, very rarely fruiting. Common on old palm-trunks (*Elaeis guineensis*), but only in the neighbourhood of Candumba in open woods by the river Cuanza ; with fr. March 1857. No. 74.

**GOLUNGO ALTO.**—A small moss growing with *Octoblepharum albidum* on trunks of palms (*Elaeis*) on the lower slopes of the mountains of Alta Queta ; without fr. Dec. 1854. No. 197.

32. **ANACAMPTODON** Brid. Mant. Muse. p. 136 (1819).

1. **A. fabronioides** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 426. t. i. fig. 5 (1872).

**GOLUNGO ALTO.**—A tender, widely cæspitose, flavescent-green moss, growing on bark and seldom producing fruit. On old trunks of *Monodora Myristica* Dun. near the rivulet of Quibolo in Queta ; with fr. end of July 1856. No. 157. On the bark of trees (*Monodora Myristica*) in the dense woods of Capopa ; with fr. Feb. 1856. No. 157b. On the ground in the coffee-yielding woods of Cungulungulo, but seldom met with : without fr. Feb. 1855. No. 190.

**CAZENGO.**—A small creeping moss of Fabronioid habit, but with double peristome. On trunks beside the river Muxaúla on the Serra de Muxaúla ; a few specimens with old fr. Jan. 1855. No. 186.

33. **THUIDIUM** Schimp. in Br., Sch. et Guemb. Bry. Eur. V. (1851-55).

1. **T. varians** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 440. t. v. fig. 3 (1872).

**PUNGO ANDONGO.**—Growing in company with *Madoteca*, *Plagiochila* and other Hepaticas on the ground and on trunks, Barrancos de Cateete ; with fr. beginning of Dec. 1856. No. 101. A cæspitose moss occurring but sparingly on the bark of old trees of "Mucuço" (*Gigalobium abyssinicum*) in the more elevated parts of Pedra de Cazella within the præsidium ; with but scanty fr. beginning of May 1857. No. 102. A yellowish green, very widely cæspitose moss, growing on the ground

in Barranco do Pungo : with immature fr. May 1857. No. 103. Laxly cespitose, growing on the shaded wet rocks of Barranco de S. Antonio : with capsules very few, young and complete with opercula : May 1857. No. 103b. A meagre moss with longly excurrent branches, mixed with other mosses (especially *Stereophyllum andongense* No. 95) at the foot of old trunks near Condo, not far from the great cataract of the river Cuanza : with a solitary fr. March 1857. No. 104.

**GOLUNGO ALTO.**—A cespitose moss, common on the rocks of the Capopa rivulet, but seldom producing fr. : with fr. Dec. 1855. Also Cascata de Capopa : with young fr. May 1856. No. 173. Terrestrial, Zengas do Queta : with fr. and young flowers 9 Nov. 1855. No. 173b. On muddy ground on the banks of rivulets : with fr. July 1857. No. 173c. On the hill-slopes of Sobato de Quilombo towards the river Zenza : with fr. Feb. 1855. No. 209.

The inner perichaetial leaves of all the above specimens bear a few long articulated ciliary filaments on each margin above the middle.

2. **T. angolense** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 441, t. v. fig. 1 (1872).

**HUILLA.**—On the bark of living trees in the forests of Monino, but rather rare : with scanty fr. beginning of Dec. 1859. No. 23. Rather rare (so at least it appeared to Welwitsch, who was pressed for time when he traversed the locality) at the foot of old trunks and upon almost lifeless trunks in the more open forests near the great lake of Ivantâa : with scanty fr. end of Feb. 1860. No. 46.

3. **T. involvens** Mitt. in Journ. Linn. Soc. xii. p. 575 (1869).

*Leskea involvens* Hedw. Musc. Frond. iv. p. 27, t. xi. (1797).

**GOLUNGO ALTO.**—A dull-green creeping moss, bearing capsules and calyptas and occurring abundantly on trees of *Pterocarpus* by the banks of the river Coango : with fr. June 1856. No. 174.

Duby discusses this plant in a note under *T. tenuissimum* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 442 (1872). Our specimens have only very young fruit.

4. **T. tenuissimum** Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 442, t. v. fig. 2 (1872).

**PUNGO ANDONGO.**—On moist ground by the side of rivulets in Barranco grande de Catete : with fr. middle of May 1857. No. 51.

**GOLUNGO ALTO.**—On the banks of the Cuango river : without fr. Feb. 1856. No. 204.

This species is perhaps identical with *T. periphyllum* C. Muell. ex Broth. in Engl. Bot. Jahrb. XXIV. ii. p. 283 (1897). The difference of the latter lies in the inclination of the theca and in the number of its cilia, as described.

5. **T. gratum** Jaeg. et Sauerb. Gen. et Sp. Musc. ii. p. 322 (1878).

*Hypnum gratum* Pal.-Beauv. Prodrome, p. 64 (1805).

**GOLUNGO ALTO.**—On the older trunks in the elevated primitive woods of Serra de Alta Queta, at an elevation of 2200 ft. above sea level : with fr. Jan. 1856. No. 143. On shaded rocks by the side of the Capopa river : very seldom producing fr. : with fr. beginning of Jan. 1856. No. 151. On the spiny trunks of Paobolo (*Zanthoxylum macrophyllum* Oliv., Herb. Welw. No. 4568) in Mata Quisueula, sparingly and with fr. scarcely mature : Feb. 1855. No. 162. On the wet rocks of Capopa : without fr. Sept. 1855. No. 162b.

34. **ERYTHRODONTIUM** Hampe in Kjönbh. Vidensk. Meddel. (1870), p. 279.

1. **E. subjulaceum** Paris Index Bryolog. p. 437 (1895).

*Pterigynandrum subjulaceum* C. Muell. in Linnaea xxxix. p. 453 (1875).

Var. **impolitum** Gepp. var. nov.

Ramuline leaves not shining, in the dry state less closely appressed than in the type, plicate under pressure, more widely acuminate.

**PUNGO ANDONGO.**—A yellowish green, creeping, widely cespitose moss, found on rotting old trunks in Barrancos de Catete, and more rarely on the bare ground in the same place: with operculate fr. and very fugacious calyptas. May 1857. No. 84.

**GOLUNGO ALTO.**—On trunks and branches of *Edwardia lurida* in the forests of Quilombo-Quiacatubia, at an elevation of 2400 ft.; with old fr. end of Feb. 1855. No. 164. Growing with *Macromitrium lyco-podioides* on old trunks, especially on *Edwardia*, in the rocky woody parts of Sobato de Quilombo-Quiacatubia; July 1856. No. 144. Welwitsch says he also gathered the plant at Alto Queta.

2. **E. bicolor** Gepp sp. n.

Plant closely and widely interwoven. Stem creeping, rooting, pinnately branched, with leaves homomallous. Branches numerous, ascending, curved, brunnescens below, flavescent above, terete-julaceous, scarcely polished, obtuse, 3 to 5 mm. long, 0.4 mm. wide when dry, 1.0 wide when wet. Ramuline leaves appressed when dry, erecto-patent when wet, 0.85 mm. long by 0.375 mm. wide, from a broad cordate base elliptic-ovate acuminate, slightly hollowed, shortly binervate, with margins erect or slightly recurved, minutely serrulate above middle; alar cells quadrate numerous, ascending to  $\frac{1}{3}$  length of margin, 0.01 to 0.015 mm. diam., with primordial utricle contracted, dense; upper cells vermiform-elongate (0.05 by 0.006 mm.), smooth, with walls lutescent.

**HUILLA.**—A densely and widely cespitose moss, covering the older tree-trunks on the northern and western sides: on nearly lifeless bark in the elevated woods of Monino near Lopollo; without fr. Apr. 1860. No. 8.

This sterile specimen appears to belong to the present genus. In habit and in leaf-structure it is related to *E. subjulaceum* Paris, but differs in the shape of the leaves which are oblong-ovate, half as wide, much less excavate. The leaves approach in shape more nearly to those of *E. Schweinfurthi* Paris (Index Bryolog. p. 437), but are much less excavate and have much less visibly reflexed margins.

35. **TRACHYPHYLLUM** Gepp gen. nov.

A genus of the family *Entodontaceae*, nearest to *Erythrodontium* and differing in the papillate dorsal surface of the leaves and in the inclined, lopsided theca. It is distinguished from *Pterigynandrum* by the very numerous alar cells of its leaves.

Stem prostrate, more or less pinnate; branches ascending, julaceous; leaves appressed (apex patent) when dry, very patent

when wet, cordate-ovate acuminate, rather concave, shortly bi-costate; margins erect; back papillate; alar cells multiseriate, small, quadrate to rhomboid-oblance, reaching to the base of the nerves and to or beyond the middle of the margin, obscured by the contracted, chlorophyllose, primordial utricle; upper cells linear-elliptic with apices projecting from the back of the leaf. Perichaetium longly exserted; seta elongate; theca inclined, unequal; operculum brevirostrate. Peristome (in *T. gastrodes*) teeth with a median furrow outside, and with lamellate trabeculae inside; processes plicate and cilia solitary, subequal to them (Duby). Calyptra unknown.

### 1. *T. gastrodes* Gepp.

*Hypnum (Heterocladium) gastrodes* Welw. et Duby in Genève, Mém. Soc. Phys. XXI, ii, p. 439, t. v, fig. 1 (1872). *Heterocladium gastrodes* Jaeg. et Sauerb. Gen. et Spec. Musc. ii, p. 311 (1878).

HUILLA. On rocks and old tree-trunks in the elevated rocky parts of Serra da Xella, where the *Tarchonanthus* woods begin, bearing very scanty fruit, most of the thecas having already fallen off; however, specimens with a few entire capsules were found June 1860. No. 22. Mixed with No. 32 (*Braunia arbuseola*) but apparently of rather rare occurrence; on *Tarchonanthus* in rocky woods at the summit of Serra da Xella: without fr. June 1860. No. 189.

This genus is designed for the reception of a few vagrant species which, though mostly unknown in the fruiting state, have in common a well-marked vegetative habit in the expansive movement of the leaves upon the application of water, and in the areolation of the leaves and their papillate dorsal surface. In the leaf-structure an approach to *Erythrodontium* is indicated, but the inclined, camptocarpous fruit is not found in that genus.

The other species referred to the genus are:—

### 2. *T. INFLEXUM*, from Nepal (Wallich).

*Hypnum inflexum* Hary, in Hook. Icon. Pl. Rar. I, t. xxiv, fig. 6 (1836); and in Hook. Journ. of Botany ii, p. 20 (1840). *Stereodon inflexus* Mitt. in Journ. Linn. Soc. Suppl. i, p. 92 (1859). *Pterigynandrum inflexum* C. Muell. in Linnaea xxxix, p. 155 (1875). *Entodon inflexus* C. Muell. in *op. cit.*, xlvi, p. 135 (1878-9). *Platygryrium inflexum* Jaeg. et Sauerb. Gen. et Spec. Musc. ii, p. 342 (1878).

The fruit of this species appears to be Stereodontaceous like that of the foregoing species.

### 3. *T. FERRICOLUM*, from Central Africa (Schweinfurth).

*Pterigynandrum ferricolum* C. Muell. in Linnaea xxxix, p. 154 (1875). *Platygryrium ferricolum* Jaeg. et Sauerb. Gen. et Spec. Musc. ii, p. 343 (1878). *Platygryrium ferricolum* corund., *op. cit.* p. 742 (1879).

### 4. *T. FABRONIOIDES*, from Mauritius (De Robillard).

*Pterigynandrum fabronioides* C. Muell. ex Besch. in Ann. Sci. Nat. sér. 6, x, p. 292 (1880). *Leptohymenium fabronioides* Besch. in *loc. cit.*

## 5. T. FERRIEZII from Mayotte (Marie).

*Leptohymenium Ferriezii* Marie apud Besch. in Ann. Sci. Nat. sér. 7. ii. p. 95 (1885).

## 6. T. CURVIFOLIUM from Rodriguez (Balfour).

*Pterogonium curvifolium* Mitt. in Phil. Trans. Roy. Soc. 168, p. 392, t. 37, fig. c. (1879).

Possibly *Pylaisia Dusenii* C.M., described by Broth. in Engl. Bot. Jahrb. xxiv. 2, p. 261 (1897), from Kamerun (Dusen, n. 810), also belongs to this genus.

## 36. RHYNCHOSTEGIUM Schimp. in Br. Sch. et Guemb. Bry. Eur. v. (1851-55).

## 1. R. Hopfferi.

*Hypnum (Brachythecium) Hopfferi* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 431. t. ii. fig. 2 (1872). *Brachythecium Popfferi* Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 392 (1878).

ST. THOMAS'S ISLAND.—A beautiful species, named after the distinguished Dr. Frid. Hopfffer, Medical Officer of Health in the Cape de Verde Islands. Welwitsch proceeds to describe this moss as caespitose, with a Hypnoid habit, or rather with the habit of a *Hookeria* : with stems prostrate rooting, and leaves distichous bright green. Plant of a bright and varying green colour : leaves from a wide amplexicaul base ovate-lanceolate, gradually acuminate, nerveless, densely areolate with narrow elongate cells : margin serrulate. Rather rare, growing with Hepaticas on old trunks in the dense primitive forests of Novo Destino, at an elevation of about 2500 ft.; with fr. Dec. 1860. No. 125.

This species is closely related to *R. megapelma* C. Muell. in Dusén, Musci Africani Camerun. exsicc. No. 221, which is described under *Hypnum (Rhynchostegium) megapelma* by Brotherus in Engl. Bot. Jahrb. xx. p. 212 (1894). But Welwitsch's plant is distinct in its lighter brighter colour, its less crowded leaves, more chlorophyllose leaf-cells, and stouter untwisted seta.

## 2. R. luteo-nitens Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 434 (1878).

*Hypnum (Rhynchostegium?) luteo-nitens* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 435. t. iv. fig. 1 (1872).

GOLUNGO ALTO.—Growing in company with *Racopilum tomentosum*, Hepaticas and *Adiantum Capillus Veneris*, and covering with wide patches of intense green the rocks by the great cataract of the Cuango stream, but very rarely producing fruit; sparingly with fruit and opercula Aug. 1855; but when Welwitsch returned in the ensuing December to collect this moss in good fruiting state, he found its whole splendour destroyed by the superabundance of the water of the fall, the plants being partly submerged. No. 178. Closely mingled with *Ectropothecium golungense* on moist shaded rocks in primitive woods above Undelle at the spot called "O Quibolo"; without fr. July 1856. No. 154, in part. With the same moss on the ground and on shaded sandy rocks around the Fonte de Capopa near Sange; without fr. March 1856. No. 180 in part. With the same moss on iron-sandstone rocks in shaded spots between Undelle and the Capopa stream; without fr. April 1859. No. 187 in part. With a species of *Raphidostegium* on bark, Zengas do Queta; without fr. No. 217. Cascate de Congo and de Cuanza, with scarcely any fr. Feb. 1856, March 1857. With No. 178

in the British Museum set. In company with *Fissidens glaucescens* (No. 142) in grottoes by the river Luinha : sterile July 1856. No. 203.

### 3. *R. oxyodon*

*Hypnum (Ectropothecium) oxyodon* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 432, t. iii, fig. 7 (1872). *Ectropothecium oxyodon* Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 537 (1879).

CAZENGO.—Leaves singly nerved, serrate. On a trunk ejected by a rushing rivulet at an elevation of 2000 ft. on Serra de Muchaúla : a few specimens with old fr. Jan. 1855. No. 185.

GOLUNGO ALTO.—Leaves ovate, shortly acuminate, singly nerved, with margin acutely serrate : not sent to Duby. Found sparingly in company with *Marchantia* at Fonte de Capopa, near Canguerasange : without fr. 1 Dec. 1854. No. 195. On the rocks of the Casaballa rivulet in Sobato de Bumba : without fr. Dec. 1855. No. 216. Also seen by Welwitsch in the Quisneula, Aug. 1857.

37. **RAPHIDOSTEGIUM** De Not. Epilogo d. Briol. Ital. pp. 17, 182. *Raphidostegium*, op. cit., p. 777 (1869).

### 1. *R. variegatum*.

*Hypnum variegatum* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 436, t. iv, fig. 4 (1872). *Taxithelium variegatum* Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 489 (1878).

HUILLA.—A widely cespitose, flavescent-green moss : fruit-stalks fuscous-coccineous erect : capsules inclined : calyptas elongate-cylindrical, smooth, yellow, dropping off long before maturity. Common, but rather rarely fruiting, at the foot of trees on the bushy swampy plain near Humpata and Empalanea, at an elevation of 5100 to 5300 ft. : with fr. Feb. 1860. No. 34. On the ground among bushes by the cataraet of Ferrão da Sola in the elevated plain of Lopollo : without fr. Feb. 1860. No. 21. Intermixed with *Isopterygium* at the foot of trees between Lopollo and Lake Ivantâla ; Feb. 1860. No. 45 in part.

### 2. *R. concolor* Gepp, sp. n.

Dioicous. Plant slender, cespitose, in tufts 7 cm. wide, flavescent-green, shining. Stem creeping, with scattered rootlets, pinnately branched. Branches numerous, suberect, mostly simple, 8 mm. long, homomallophyllous, 1.25 mm. wide with the leaves. Leaves sub-orthostichous, imbricate, erecto-patent, from a contracted base ovate, suddenly longly and narrowly acuminate, excavate, with margins more or less revolute, serrulate above middle, subserrate towards apex, with two short nerves : cells elongate narrowly sinuato-elliptic, very dilutely chlorophyllose, with pellucid hyaline cell-walls ; lowest basal cells concolorous ; alar cells 3 or 4, very lax, hyaline, very thin-walled ; supralar few, lax, hyaline. Perichaetial bracts 8, erect : outer 0.6 to 0.8 mm. long, lanceolate acuminate ; innermost 2.5 mm. long, elliptic lanceolate, suddenly very longly and narrowly attenuate, remotely serrate towards apex, with cells larger and firmer. Seta 1.5 mm. long, very slender, pale reddish, smooth, bent at apex. Theca inclined or horizontal, longly ellipsoidal, with a short neck, fuscous. Peristome as in *R. variegatum*. Operculum convex, shortly and bluntly rostrate.

**HUILLA.**—A widely cespitose moss, of a brilliant green colour, or sometimes of a shining flavescent green. Common, but seldom bearing fruit, on the ground or at the foot of old trees in forests between Lopollo and the Monino river: with fr. end of Dec. 1859. No. 35.

This species is very closely related to *R. variegatum* in the shape of the leaves and the peristome: but appears to be sufficiently distinct in the glistening uniformly green colour, pinnate ramification, longer branchlets, more erect leaves with more delicate less distinct cells, and longer capsule. In *R. variegatum* the nerves and cell-walls of the leaves are lutescent, and the cell contents are contracted into a thin sinuate more or less evanescent thread.

### 3. *R. physaophyllum.*

*Hypnum (Isothecium) physaophyllum* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 434. t. iv. fig. 2 (1872). *Isothecium physaophyllum* Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 366 (1878).

**PUNGO ANDONGO.**—A deep green, densely cespitose moss: on damp ground and at the foot of old tree-trunks in forests between Mutollo and Candumba, but very rarely bearing fruit; with fr. beginning of March 1857. No. 100.

This species is less robust than *R. chrysotis* Broth. [Engl. Bot. Jahrb. XXIV. ii. p. 275 (1897)], and is of a brighter and more uniform green colour: but in that species it appears to find its nearest ally. In the theca there is a close resemblance, but Duby found no cilia in the peristome. The leaves of Welwitsch's plant are more crowded, less spreading, shorter, longly acuminate, with margins usually recurved, with two very short nerves, and alar cells four instead of six, and not forming an auricle. The branches are obtuse, not pungent, at apex.

With the above species should be compared the following:—

**GOLUNGO ALTO.**—On bark with *Rhynchostegium luteo-nitens*, Zengas do Queta; without fr. No. 217, in part.

To the present genus are to be referred the following numbers in the British Museum:—

**PUNGO ANDONGO.**—A creeping moss with ascending branches. Apparently rather rare on dead branches of *Vellozia*, on the more elevated rocks within the præsidium; with scanty fr. end of April 1857. No. 73.

**GOLUNGO ALTO.**—In company with No. 170 (*Stercophyllum lingua-folium*) and with some Hepaticæ on the bark of trees growing in the shady forests of Serra de Alto Queta; with fr. July 1856. Amongst Hepaticæ, Queta Central: with fr. July 1856. Alto Queta Central: with fr. July 1856; in company with No. 167 (*Porotrichum elongatum*) on rather stout living trunks in dense primitive woods near Trombeta: with fr. Aug. 1857. No. 171.

## 38. **TRICHOSTELEUM** Mitt. in Journ. Linn. Soc. x. p. 181 (1869).

### 1. *T. truncatum.*

*Homalia truncata* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 430. t. iii. fig. 5 (1872).

**PUNGO ANDONGO.**—A widely cespitose, glaucous-green moss, occurring sparsely in rocky shady places at Luxillo, but bearing very scanty fruit; with fr. May 1857. No. 105. Creeping on the bare roots of small ferns (*Asplenium*) by the banks of rivulets in Barranco de S. Antonio within the præsidium; without fr. May 1857. No. 114.

This species, which bears a misleading resemblance to the *Hylotrichia* section of the genus *Hookeria*, is nearly allied to *T. truncatulum* Jaeg. et Sauerb. gathered in Peru by Poppig; also to *Taxithelium purpureo-caule* Broth. from the Cameroons (Dusén, No. 701), but in that plant the leaves are not papillate.

39. **TAXITHELIUM** Spruce Catal. Musc. p. 14 (1867); Spruce ex Mitt. in Journ. Linn. Soc. xii. p. 496 (1869).

1. **T. stenosekos.**

*Hypnum stenosekos* Welw. et Dub. in Genève, Mém. Soc. Phys. XXI. ii. p. 438, t. i. fig. 2 (1872). *Isopterygium stenosekos* Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 503 (1878).

PUNGO ANDONGO.—On old tree-trunks near the great cataract of the Cuanza river at Condo and Mata de Quisonde: specimens with opercula and with young calypters gathered in the same place: with fr. March 1857. No 98.

The foliage of this species is compressed as in *T. compressicaule* Broth. from the Cameroons (Dusén, No. 758), but the leaves of Welwitsch's plant are shorter, more obtuse, with the alar cells larger and colourless, and the upper cells seriatly papillate.

2. **T. andongense** Gepp, sp. n.

Widely cespitose, lutescent-green, dull; branches elongate, creeping, straggling, here and there attached by rootlets, pinnately branched; branchlets up to 2 cm. long, patulous, flexuose, compressed, laxly foliose, obtuse; ramuline leaves laxly imbricate, patent, concave, from a constricted base oblong or ovate-oblong, very shortly acuminate or obtuse and terminated by short apiculus; margins erect, at apex minutely denticulate; nerves wanting; cells elongate, very narrow, smooth or bearing a single median dorsal papilla (more rarely two seriate papillæ); alar cells 3 to 5, vesicular, hyaline; supra-alar few, hyaline, quadrate. Inflorescence, fruit, etc., wanting.

PUNGO ANDONGO.—In the shaded woody parts of Barranco de Pedra de San Antonio; sterile. May 1857. No 112.

This species differs from the preceding in being of a deeper green colour and of a straggling and more irregular habit, but especially in the scarcity of papille on the leaf-cells. It is quite distinct from *T. compressicaule* Broth. (Cameroons, Dusén, No. 758) in habit, and from *T. rotundatum* Broth. (Cameroons, Dusén, No. 703) in habit, leaf-shape and papille.

40. **ISOPTERYGIUM** Mitt. in Journ. Linn. Soc. xii. p. 497 (1869)

1. **I. Welwitschii** Gepp, sp. n.

Autoicous. Plant densely and widely cespitose, depressed, slender, lutescent green, glistening; stem longly creeping, pinnately branched; branches 15 mm. long, compressed, with rather dense foliage; branchlets pinnately arranged, 3 to 5 mm. long, compressed, acute; leaves complanate, laxly imbricate, rather concave, from a contracted base obliquely ovato-lanceolate acuminate, rather rugulose, with margins more or less revolute, serrulate minutely above and very minutely below; nerves two,

very short or obsolete; cells elongate, very narrow, with firm flavid walls, basilar cells lax, alar two upon two subquadrate, lax; perichaetial bracts erect, lanceolate, longly acuminate, serrulate; seta 15 mm. high; theca subhorizontal, ovoid, with a short rugulose neck; endostome processes subperforate, cilia one or two interspersed; operculum obliquely conic, shortly rostrate.

**HUILLA.**—Terrestrial or on the base of old trunks in the forests of *Leguminosæ*, called "Matas de Panda" i.e. *Brachystegia* and *Berlinia*, between Lopollo and Lake Ivantala, collected during the flight; with fr. end of Feb. 1860. No. 45.

This species resembles *I. Antunesii* Broth. in Engl. Bot. Jahrb. XXIV. ii. p. 264 (1897), gathered in Huilla, in the imbricated arrangement of its leaves, but is a smaller and much more slender plant with a short-necked theca.

## 2. *I. Dubyi* Gepp, sp. n.

Anticoons. Plant rather robust, widely and laxly cespitose, flavescent-green, depressed. Stem 5 to 6 cm. long, creeping, laxly pinnately branched, with homomallous leaves; branches 7 to 13 mm. long, usually simple, very compressed, with rather dense foliage, diameter with the leaves 2.5 mm., obtuse. Rameal leaves very complanate, widely divergent, rather hollow, obliquely ovato-lanceolate, shortly acuminate, with margins a little recurved, quite entire or at the apex very minutely serrulate or denticulate; nerves two very slender,  $\frac{1}{4}$  the length of the leaf; cells elongate (10 by 0.75  $\mu$ ), basilar lax; perichaetial bracts erect, lanceolate, longly acuminate, minutely serrulate above, lower cells lax, basal cells brown; seta 14 to 15 mm. high, yellowish-red; theca horizontal, oval, subincurved, with mouth oblique, neck short rugulose; processes of endostome subperforate, cilia solitary; operculum convex, shortly rostrate.

**PUNGO ANDONGO.**—A very pretty and not uncommon moss, yellow-green, or bright-gold in drier situations, widely cespitose on stones and moist earth by rivulets and springs in the woody parts of Barrancos de Mata de Pungo; with fr. beginning of May 1857. No. 97.

This species bears some resemblance to *Hypnum lencophunes* Hampe (*Plagiothecium* C. Muell.; *Isotryggium* Jaeg. et Sauerb.) in its foliage but has wider leaf-cells.

Allied to the preceding species are the following numbers:—

**PUNGO ANDONGO.**—In company with *Cumylopus horridus* (Welw. No. 76), Barranco de Pedra Songue; with fr. April 1857. No. 77. Within the praesidium on shady ground near Caghuy, with unripe fr.; and on moist ground in rocky places near Caghuy, not far from the praesidium, sterile; March 1857. No. 110. A yellow-green moss with bright-purple fruit-stalks, common, but seldom fertile, on the most deeply shaded ground in the primitive woods of the island "Calemba" in the river Cuanza not far from Quisonde; with fr. March 1857. No. 111. A widely cespitose, humble, creeping moss, on the ground in marshy woody places near Luxillo; sterile, Feb. 1857. No. 120; also No. 205, in part.

**BUMBO.**—Mixed with Hepatics, attached to rocks in primitive forests near Chão da Xella on the ascent of Serra da Xella; without fr. June 1860. No. 43.

II. **ECTROPOTHECIUM** Mitt. in Journ. Linn. Soc. x. p. 180 (1869).

1. **E. capillisetum** Kindb. Enum. Bryin. Exot. p. 98 (1891).

*Hypnum (Cupressina) capillisetum* C. Muell. in Flora 69, p. 521 (1886).

GOLUNGO ALTO.—On shaded rocks in woods of *Raphia tristis* by the Delambao river, with a few old and young capsules and calypters : July 1856. No. 177.

The type of this species was gathered by H. Soyaux in Pungo Andongo on moist rocks by the river Engamzambe : 30 March 1875.

Possibly the following sterile and imperfect specimens also belong to this species :—

GOLUNGO ALTO.—A brilliant flavescent-green plant, widely cespitose on the banks of rivulets in dense woods : Mata de Quisucula : Jan. 1856. No. 172.

PUNGO ANDONGO.—On the exposed roots of old trunks in woods near Luxillo, apparently rather rare : May 1857. No. 99.

2. **E. strephomischos.**

*Hypnum (Leuciumium) strephomischos* Welw. et Duby in Genève, Mém. Soc. Phys. XXI, ii. p. 431, t. i. fig. 6 (1872). *Leuciumium strephomischos* Jaeg. et Sauerb., Gen. et Spec. Musc. ii. p. 539 (1879).

GOLUNGO ALTO.—Flavous-green, rather shining, widely and densely cespitose, but apparently very rarely bearing fruit, [the British Museum specimens are well supplied with fruit] : on the withering fronds of rather large ferns (*Platycerium angolense* Welw.) in the forests of Quibanga ; with fr. July 1856. No. 179. In the same place : not however on *Platycerium* itself, but at the foot of the same tree : on ground by the tree on which was growing *Platycerium*, the matrix of No. 179, in the forests of Quibanga ; with fr. July 1856. No. 179b.

In size and general appearance this species approaches exceedingly closely to *Vesicularia bryocarpa* C. Muell. in Dusén's mosses from the Cameroons (No. 311), but differs in having a pendulous (not inclined) theca and in not fruiting copiously. To *E. contractile* Broth. from the Cameroons (Preuss, No. 1026) it is also nearly allied, especially in the texture of the leaves. The leaf-cells contract and become indistinct when dry, and expand very slowly in water. The leaves of Welwitsch's plant are much more longly and gradually acuminate, and the stems are not nearly so long as in *E. contractile*.

The following specimen, the fruit of which was already destroyed when Welwitsch collected the plant, is allied to the above species and also to *E. glauculum*, described by Brotherus in Bol. Soc. Brot. viii. p. 186 (1890), and collected in the same island by Quintas :—

ISLAND OF ST. THOMAS.—Cespitose on moist rocks and on half-rotten trunks in the vicinity, in the woods of Novo Destino, at an elevation of 2500 ft. : without fr. Dec. 1860. No. 123.

3. **E. golungense** Jaeg. et Sauerb. Gen. et Spec. Musc. ii. p. 538.

*Hypnum (Ectropotherium) golungense* Welw. et Duby in Genève, Mém. Soc. Phys. XXI, ii. p. 432, t. ii. fig. 4 (1872).

GOLUNGO ALTO.—A very fine moss hanging down at some length from rocks which are constantly wet, but never noticed to be bearing fruit ; at the cataract of the Quibolo spring : without fr. March 1856.

No. 152. Yellowish green, caespitose and emitting runners: on wet rocks by the rivulet Quiapôze near Caminho para Mussengue: with fr. middle of June 1857. No. 153. A single specimen gathered on rocks inundated by the rivulet of Capope in a mountain-wood near Sange: with scanty fr. Dec. 1854. No. 153b. On wet shaded rocks by a cataract in primitive woods above Undelle, at the place called "O Quibôlo;" common but not bearing much fruit, however in the larger tufts young calyptaras were present in July 1856. No. 154. On wet muddy ground by the river Cuango; with fr. June 1856. No. 158. In company with *Marchantia* and other Hepaticas in shaded places by the Capopa spring: with scant fr. but good and operculate, Sept. 1856. No. 175. Very widely caespitose, intensely green, growing on the wet banks of rivulets: on rocks by the rivulet of Quibôlo near Sange: with fr. middle of June 1857. No. 176. Widely caespitose, mixed with *Rhynchostegium luteonitens*, on the ground and on sandy rocks in shaded rocky places, Fonte de Capopa near Sange; with fr. March 1856. No. 180. On rocks by the Moio river on the ascent to Quilombo Quiacatubia; with fr. Jan. 1855. No. 180b. With *Rhynchostegium luteonitens* etc. on mossy rocks of iron-sandstone in shaded places, at an elevation of 2500 ft., between Undelle and the Capopa river: with scanty fr. April 1856. No. 187. With a small species of *Fissidens* on the ground in woods, Quilombo Quiacatubia: with fr. July 1856. No. 214. With the same species of *Rhynchostegium*, widely caespitose, on rotting trunks in Barranco de Capopa; 19 Aug. 1857. No. 215.

This species belongs to the subgenus *Vesicularia*, and its type-specimens appear to be Nos. 154, 175, 176, 180. In the absence of one distinct and definite type with which the numerous other specimens may be compared, such minor differences as are observable in some of the latter lose their value.

#### 4. *E. chlorizans*.

*Hypnum chlorizans* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 437. t. iv. fig. 6 (1872). *Microthamnium chlorizans* Jaeg. et Sauerb. ii. p. 491 (1878).

GOLUNGO ALTO.—Widely caespitose on the banks of rivulets in well lighted primitive woods, Sobato de Bumba; with old fr. end of May 1855. No. 163. Also Quisucula. With Alga No. 178.

A remarkable species agreeing with the subgenus *Vesicularia* in its habit, in the complanate arrangement of its diversiform leaves, but distinct in the Porotrichoid areolation of the leaves. The leaves are of two sorts: those of the upper side are distichous, patulous, imbricate, complanate, 1.0 mm. long by 0.45 mm. wide, from a narrowed base, obliquely ovate (rotundate on one side, infolded on the other side), acute shortly acuminate, faintly bicostate, with margins irregularly denticulate above middle and here and there revolute; cells pachydermatous, upper oval-hexagonal (0.012 by 0.006 mm.), lower longly elliptic-hexagonal (0.025 by 0.005 mm.), alar impressed and difficult to distinguish but apparently three or four fugacious inflated hyaline cells with a few sub-obscure quadrate cells superposed. Leaves of the under side variable in size (0.6 to 1.0 mm. long by 0.25 to 0.3 mm. wide) patent from a sub-oblique ovate base lanceolate longly acuminate, with margins more or less recurved, cells all elongately elliptic (0.03 by 0.005 mm.) sinuous with cell-walls 0.005 mm. thick. The apex of the seta is curved and thickened (plicate when dry) forming a neck joined obliquely to the theca. Theca usually horizontal, oval and asymmetrical, becoming subcylindric with age, a little contracted below the

large and oblique mouth when dry: operculum Brachythecioid-conic 0.5 mm. long; sporangium with operculum 1.2 mm. long.

#### 42. **LEUCOMIUM** Mitt. in Journ. Linn. Soc. x. p. 180 (1869).

##### 1. **L. golungense** Gepp, sp. n.

**Monoicous.** Plants laxly cespitose, pale green, not glistening; stem creeping, sparingly and irregularly pinnately branched; branchlets 5 to 10 mm. long by 4 to 5 mm. wide (with leaves), complanate, obtuse, with rather lax foliage; lateral leaves patulous, rather curved, lanceolate, median leaves elliptic, all rather hollow piliform-acuminate, nerveless, quite entire; cells lax, rhomboidal; perichaetial bracts much smaller, the innermost being truncate, erose, suddenly longly apiculate; seta 10 mm. long, red, towards its apex curved and slightly seaberious; theca inclined or horizontal, oval, occasionally substrimous, more or less constricted below the mouth when dry.

**GOLUNGO ALTO.**—Subglaucous (when gathered), very laxly cespitulose on rocks and trees alongside the Catombe rivulet in the mountains of Alto Queta, but in small quantity; with fr. middle of June 1857. No. 191. A moss of an intense and bright glaucous-green colour, covering exposed muddy spots by rivulets in the primitive forests of Quisnena, in company with *Begonia*; with fr. June 1856. No. 192. On rocks in the forests of Queta-Zengas, growing with *Sprucella succida* (No. 219); gathered with fr. (now lost), no date. No. 191b. An elegant moss of a pleasant green colour, clothing with its wide tufts the rocks by the spring of Capopa; Oct. 1854. No. 194.

This species appears to be distinct from the Cameroons plant *L. perglaucum* Broth., described in Engler's Botan. Jahrb. Band. xxiv. p. 273 (1897), in several particulars, such as the foliage, the shape of the leaves, and the theca.

#### 43. **STEREOPHYLLUM** Mitt. in Journ. Linn. Soc. Suppl. i. p. 117 (1859).

##### 1. **S. omalosekos** Jaeg. et Sauerb. Gen. et Spec. Muse. ii. p. 511 (1879).

*Hypnum (Stereophyllum) omalosekos* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 433. t. iv. f. 3 (1872).

**PUNGO ANDONGO.**—In enclosed rocky valleys near Catete on bark and on ground at the foot of trees; with fr. May 1857. No 106.

The upper cells of the leaves are unipapillate as in *S. cabense* Mitt. The seta is 9 mm. long.

##### 2. **S. andongense**.

*Hypnum Andongense* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 438. t. i. f. 1 (1872). *Ruphidostegium Andongense* Jaeg. et Sauerb. Gen. et Spec. Muse. ii. p. 456 (1878). *Hypnum (Thamnium!) decolorans* Welw. et Duby, op. cit., p. 435. t. iii. f. 3 (1872). *Thamnium decolorans* Jaeg. et Sauerb., op. cit., p. 216 (1877).

**PUNGO ANDONGO.**—On moist ground by rivulets in the Barrancos de Catete; with fr. May 1857. No. 93. Barranco grande de Catete, without fr. April and beginning of May 1857. No. 93b. A widely cespitose, brilliantly green, moss found on tree trunks near the great

cataract of the river Cuanza at Condo ; with fr. beginning of March 1857. No. 95. A laxly cespitose, glistening and intensely green moss, closely adhering to shaded rocks in Mata de Pungo ; with fr. middle of May 1857. No. 75. Terrestrial, deep green, very widely cespitose on the banks of rivulets within the præsidium, Barranco de Songue ; without fr. end of May 1857. No. 91. Common, but rarely producing fruit, in damp grottoes by the Casalale brook ; with fr. April 1857. No. 92. Deep green, almost turning to black, very widely cespitose on moist rocks by the sources of the rivulet in the elevated parts of the Barranco de S. Antonio ; without fr. May 1857. No. 94.

These plants appear to be so closely related as to belong to one and the same species, of which No. 93 is the type. Variations in the size and shape of the leaves are common to all. The youngest leaves usually have their cells plainly unipapillate, while on the older leaves the papillæ are seldom conspicuous. No. 92, the type *Hypnum decolorans* Welw. et Duby, is characterised by its darker colour and slower capacity for absorbing water, both of which properties may be due to the influence of its place of growth. The species is at once distinguished from *S. omalosekos* by having a seta more than twice as long, and theca nearly twice as long.

### 3. *S. linguæfolium*.

*Homalia linguæfolia* Welw. et Duby in Genève, Mém. Soc. Phys. XXI. ii. p. 431. t. iii. f. 6 (1872).

GOLUNGO ALTO.—A bright-green obtuse-leaved moss occurring on the sturdy trunks of trees, especially Meliaceæ (*Entandrophragma*), growing in the shaded primitive forests of Serra de Alto Queta, but sparingly ; also in Trombeta and Queta Central ; with young and mature fr. Dec. 1855 and Aug. 1857 ; also on the older trunks of *Entandrophragma angolense* in the forests of Quibolo ; with fr. May 1856. No. 170. With *Eulejeunea Breutelii* on tree trunks in the forests of Queta Central ; July 1855. No. 220, in part.

This species is nearly allied to *S. Basseanum* C. Muell. (Dusén Exsicc. No. 7) and to *S. leptotypes* C. Muell. (Dusén Exsicc. No. 676), both from the Cameroons, but is a smaller plant with the apices of its leaves more obtuse and rounder and the cell-walls thicker. *S. nitens* Mitt., described in Trans. Linn. Soc. xxiii. p. 51 (1860-2), is characterised as having its leaves subacute at apex, and appears to have narrower and less elliptical leaves (*i.e.*, tab. v. fig. 3).

### 4. *S. auriculatum* Gepp, sp. n.

Monoicons. A small, corticolous, depressed, glistening plant ; stem adhering with brown rootlets, vaguely branched ; branches prostrate, complanate, of 2 mm. diam. with their leaves, obtuse ; lateral leaves patent, median appressed, all concave, from a contracted base longly ovato-lanceolate acute, 1.65 mm. long by 0.6 mm. wide, with margin more or less infolded on one side and serrulate towards apex, sometimes with four or five apical denticulations ; nerve slender and vanishing in the middle of the leaf ; cells of the basal angles of the leaf quadrate and numerous, and forming on one side of the lateral leaves a flavescent sub-inflated auricle with laxer cells, upper cells elongate and firm-walled, apical longly elliptic, all smooth ; perichaetal bracts smaller, acuminate, serrulate ; seta 10 mm. long, red, slender, curved at apex ; theca sub-horizontal, oval, more than 1 mm.

long, constricted beneath the mouth when dry; peristome double, the teeth yellow, trabeculate and densely striolate below, attenuated and papillate above, 0.3 mm. long; internal peristome columellæ, the plicate membrane rising to half the length of the teeth and bearing subperforated processes and solitary cilia, both papillate; operculum convex, shortly, thickly and obliquely rostrate.

PUNGO ANDONGO.—Cespitose on trunks of old trees in damp forests near Luxillo; with fr. middle of May 1857. No. 107. A few small specimens with all their capsules unfortunately lost, gathered on the bark of old trees of "Muengo" (*Giglochitium abyssinicum*), upon the more elevated rocks (3300 ft.) within the præsidium, beginning of May 1857. No. 81.

This species is closely allied to *S. linguaefidium*, but is readily distinguished by its acutely pointed leaves usually auriculate on one side of the base.

The following numbers represent indeterminate specimens or mixtures of scraps:—

HUILLA.—With *Brachythecium* (No. 37) : on the base of old trunks in forests near Lopollo; with poor fr. May 1860. No. 38.

CAPE DE VERDE ISLANDS.—The only moss observed by Welwitsch in the whole island of S. Vicente: in company with *Nephrodium hirsutum* on basaltic rocks at an elevation of 1600 to 1800 ft. on the mountain called "Monte Verde"; without fr. end of August 1853. No. 121.

GOLUNGO ALTO.—A mixture on old trunks of *Edwardia lurida* in Sobato de Quilombo; Feb. 1855. No. 130<sup>b</sup>. A mixture growing with *Burhulia* (No. 134) near Bango Aquitamba; May 1856. No. 208. Mixture amongst *Rucopilum*, Mata de Quisuenla; Jan. 1855. No. 210. Mixture, Quisuenla; Feb. 1855. No. 289.

PUNGO ANDONGO.—On the older stems of *Vellaria* on the more elevated rocks of the præsidium; end of April 1857. No. 207.

Some specimens of the protonema of mosses were found among the Fungi. Their numbers are as follows:—

GOLUNGO ALTO.—On the bark of dead branches in the forests of Quibanga; July 1857. No. 43. On rotting trunks in the forests of Queta Central; June 1856. No. 44. On the thicker dead branches on the wooded slopes towards Zenza, Sobato de Bumba; Oct. 1855. No. 44<sup>b</sup>.

# HEPATICS.

BY F. STEPHANI.

If these plants, collected by Welwitsch in Angola, had been examined twenty years ago, the greater part of them would have been new to us; since that time, however, a great many Hepaticas have come in from Western Tropical Africa, particularly from the islands of St. Thomas and Fernando Po, as well as from the neighbourhood of the Cameroons Mountains, so that only eight new species remain, the descriptions of which are here inserted.

As to the geographical description of the following Hepaticas, there are some amongst them which have been found in all tropical countries, as *Eulejeunia flava* Spruce, *Frullania squarrosa* Nees, *Dumortiera hirsuta* R. Bl. et N., *Cyathodium cavernarum* Kunze, *Aneura pinguis* Dumort., and *Anthoceros communis* Steph.; others belong to the flora of tropical South America, like *Lopholejeunea Sagræana* Spr., *Cololejeunea crenatiflora* Steph., and *Symphyogyna brasiliensis* Nees. Quite a number have been found also at the Cape: for instance, *Lejeunea Brentelii*, *L. Pappeana*, *Ricciella Rantanenii*, and *Plagiochasma muricata*.

What remains is entirely of African origin; and the most interesting specimen is *Exormotheca pustulosa*, formerly known from Madeira and Teneriffe. Recently a new species of this genus has been found in Eastern Tropical Africa; so that it may safely be considered a tropical genus of that continent. Graf zu Solms-Laubach in a splendid paper [Bot. Zeit. (1897) pp. 1-16, tab. I.] has already expressed an opinion to this effect.

1. **RICCIA** Micheli Nov. Pl. Gen. p. 106. t. 57 (1729); G. L. et N. Synops. Hep. p. 598 (1846).

1. **R. angolensis** Steph. sp. n.

Dioicous. Plant rather small, glaucous-green, gregarious. Frond 5 to 6 mm. long, from a narrow base obcordate or obconic oblong, shortly furcate, with the forks widely divergent, shortly ligulate, widely rotundate at apex and shortly bilobed, everywhere almost plane, beneath the apex only exhibiting a short groove, on the postical side a little incrassate; costa convex, longly and gradually attenuated into the wings; margins thin. Frond in transverse section six times wider than thick; antical surface plane, postical widely lunate, with the angles longly acuminate, acute. Postical scales large, obliquely ovate, remote, spotted with purple, quite entire, longly produced.

HULLA.—Glaucous-green : widely caespitose on rocks in the elevated parts of Serra de Oiahoia near Humpata : May 1860. No. 255

2. **RICCIELLA** A. Br. in Flora od. Bot. Zeit. p. 756 (1821).

1. **R. abnormis** Steph. in Hedwigia xxx. p. 213 (1891).

PUNGO ANDONGO.—Gregarious in caverns of the more elevated rocks on Pedra de Cazella within the praeidium, April 1857 : in rocky places by the river of Pungo Andongo : March 1857. No. 229.

GOLUNGO ALTO.—A fleshy, glauco-papulose, very fragile little plant On the muddy rocks of the Carenghe rivulet of Alta Queta: April 1856. No. 309a. On moist ground by the rivulet of Quarengue in Queta Feb. 1856. No. 309b.

2. **R. Rautanenii** Steph. in Bull. Herb. Boissier, III, p. 371 (1895).

MOSSAMEDES.—Rather common in the littoral region of the plain of Mossamedes : in muddy-sandy places by the banks of the river Bero (or Rio das Mortes) near Cavalheiros : with fr. July 1859. No. 257.

3. **R. Welwitschii** Steph. sp. n.

Dioicous. Plant rather large, flavous-green, stellately expanded or substratified. Frond up to 6 mm. long, oblongo-oblanceolate, shortly furcate at apex, with the forks short divergent, deeply bilobed ; thin, narrowly reticulate owing to the appearance of the lamellae in transmitted light ; costa very small, a few cells in depth, about one-third the width of the frond, the wings in consequence very much exceeding the width of the costa : margins very thin, containing very shallow cavities ; stratum of air-cavities shallow, with the lamellae almost horizontal. Spores 12 $\mu$ , not reticulately lamellate, rough all over with very crowded short spines.

LIBONGO.—The only Hepatic till then found or observed in the littoral region by Welwitsch. Frond bright-green (not glaucous), stellately expanded, close pressed to the ground. On the shaded moist-sandy banks of the river Lifune above Banza de Libongo (in the Arimo de Sr. Freire) : with fr Sept. 1858. No. 260.

3. **CYATHODIUM** Kunze in Lehm. et Lindenb. Pugill. Plant. vi. p. 17 (1834).

1. **C. cavernarum** Kunze, l.c., p. 18.

PUNGO ANDONGO.—Covering the rocks by the rivulet of Mutollo with wide, grass-green, cushion-like patches, the fronds overlapping like scales ; Jan. 1857. No. 226. A glaucous-green, velvety Hepatic, labellately expanded on moist ground, on rocks near Cabondo within the praeidium : Feb. 1857. No. 238.

GOLUNGO ALTO.—A plant of very thin spongy texture, in the living state of a very bright green colour and stellately expanded on the rocks, but in the dry state completely collapsing : at the cataracts of the spring called Quibolo, Monte de Queta, March 1856. No. 312 Thallus glaucous-green very thin : on rocks by the Capopa spring : Jan 1856. No. 317. Growing on the ground and moist rocks, with the frond closely adpressed, very thin, glaucous-green, velvety, but unfortunately in the dry state soon turning yellow and collapsing : common on rocks by the cataracts of Capopa near Sange : Jan., Feb. and July

1856. No. 323. Glaucous-green more or less closely applied to the ground and radiately circular; on rocky soil in moist places by the Delambao rivulet; middle of June 1857. No. 329.

CAZENGO.—Bright green, in the living state almost emerald-green, very thin, with thallus or fronds lobed, stellate; on the rocky banks of the river Luinha; Jan. 1855. No. 330.

4. **PLAGIOCHASMA** Lehm. et Lindebu. Pugill. Plant. iv. p. 13 (1832).

1. **P. tenue** Steph. in Bull. Herb. Boiss. VI. p. 779 (1898).

PUNGO ANDONGO.—Wide spread on the margins of grottoes in elevated parts of the rocks of Pedra de Cazeila: Apr. 1856. No. 236.

The following specimen, which does not yield to the softening action of water, and hence does not admit of identification, may be referred to this genus. Welwitsch describes the living plant as elegant, applied to the ground, branching stellately, with fronds subglaucous.

PUNGO ANDONGO.—Rather rare in elevated, rather moist, rather shady, rocky places, Pedras de Guinga; March 1856. No. 244.

5. **FIMBRIARIA** Nees, Hor. Phys. Berol. p. 44 (1820) (*Fimbraria*); G. L. et N. Synops. Hepat. p. 555 (1846).

1. **F. Preussii** Schiffn. apud Steph. in Engl. Bot. Jahrb. xx. p. 303 (1895).

HUILLA.—In elevated woody places by the rivulets of Morro de Monino; Apr. 1860. No. 258.

6. **DUMORTIERA** Reinw. Blume et Nees in Nova Acta Acad. xii. p. 410 (1825).

1. **D. hirsuta** Reinw. Blume et Nees, *op. cit.*, p. 410.

*Marchantia hirsuta* Swartz Prod. Fl. Ind. Occ. p. 15 (1788).

GOLUNGO ALTO.—On moist shady rocks, Capopa; with incipient fr., Sept. 1856. No. 310. Widely cespitose and remarkable for its shining dark green colour; rather rare on schistose rocks in exceptionally shady places by the rivulet of Capopa, Canguerasange; 1 Dec. 1854. No. 321. Quisucula; Aug. 1857. No. 321b. Fleshy, bright green, in the living state rather rigid and fragile, very sparingly fruiting, growing cespitously by the banks of rivulets; sterile Jan. 1856, and with a very few young fr. July 1856. No. 322. In very shaded spots, Barranca de Capopa; with young fr. 19 Aug. 1857. No. 332.

7. **MARCHANTIA** Mich. Nov. Pl. Gen. p. 1 (1729); G. L. et N. Synops. Hepat. p. 521 (1846).

1. **M. planiloba** Steph. in Eng. Bot. Jahrb. viii. p. 90 (1886).

AMBACA.—Frequent on moist rocks by the Pamba rivulet; Oct. 1856. No. 245.

GOLUNGO ALTO.—With both forms of fructification present (the British Museum specimens are quite sterile); common on shaded rocks by Fonte de Capopa, Canguerasange; 1 Dec. 1854. No. 306. By rivulets near Trombeta; Sept. 1857. No. 307. On clay soil by the Cazengue rivulet on the mountains of eastern Queta; with fr. June 1856. No. 308. By the Capopa rivulet; Apr. 1855. No. 319. A bright green little plant, with thallus rather thick, in the living state

rather fragile, ornamenting rocks and moist ground by springs and rivulets with its more or less circularly stellate tufts, and frequently bearing fruit; on the wet precipitous sides of a rivulet, Serra de Alta Queta, beginning of Sept. 1855. No. 320. Rather rare on the banks of the Delamboa stream: Apr. 1856. No. 327. With trimorphous fructification (male and female receptacles and gemmae); on the rocky margins of the Coongo river: May 1855. No. 328.

8. **EXORMOTHECA** Mitt. in Godman, Nat. Hist. of the Azores, p. 325 (1870).

1. **E. pustulosa** Mitt., *l.c.*, p. 326.

HUILLA.—Frequent on rocks and ground near by in precipitous elevated parts of Morro de Monino: with fr. April 1860. No. 259.

9. **ANEURA** Dumort. Comment. Bot. p. 115 (1823).

1. **A. pinguis** Dumort., *l.c.*

ISLAND OF ST. THOMAS.—Bright green, rather fleshy, with wide fronds, interwoven with various mosses, growing on half-rotten trunks in the forests of Novo Destino at an altitude of about 2500 ft.; without fr. Dec. 1860. No. 267.

10. **FOSSOMBRONIA** Raddi in Mem. Soc. Mod. xviii. p. 10 (1820).

To this genus belongs the following specimen which, having no spores, cannot be identified.

PUNGO ANDONGO.—Almost stemless with leaves glaucous, crisped undulate, with the brownish red capsule borne on a thick white pedicel but easily breaking away; among tufts of mosses in elevated caves, Pedra de Cazella; with fr. beginning of Jan. 1857. No. 237.

11. **SYMPHYOGYNA** Mont. et Nees in Ann. Sci. Nat. Ser. 2, v. p. 66 (1836).

1. **S. brasiliensis** Nees, *op. cit.*, p. 67.

HUILLA.—On rocks and soil in the vicinity in rather elevated wet woody places by the banks of the Monino river, May 1860. No. 256.

12. **CEPHALOZIA** Spruce, On Cephalozia, p. 1 (1882).

1. **C. fissa** Steph. in Hedwigia, xxx. p. 204 (1891).

PUNGO ANDONGO.—In company with *Selaginella* sp. in very shaded grottoes in the more elevated parts of the volcanic mountain called Cazella; end of Dec. 1856. No. 246.

HUILLA.—Delicate, forming beautiful green, velvety coverings on rocks at an elevation of 5200 ft., Morro de Lopollo; 8 Jan. 1860. No. 252.

13. **SPRUCELLA** Steph. in Engl. Bot. Jahrb. viii. p. 92 (1886); et in Hedw. xxx. p. 214 (1891).

1. **S. succida** Steph., *l.c.*

*Lepidozia succida* Mitt. in Trans. Linn. Soc. xxiii. p. 57, t. vi. f. 23 (1860).

GOLUNGO ALTO.—With *Leuconium* on rocks in the forests of Queta Zengas. No. 219. Elegant, glaucous, with fronds horizontally creeping on clay soil near Zengas do Queta; 25 July 1856. No. 283.

14. **LOPHOCOLEA** Dumort. Rec. d'Observ. p. 17 (1835).

1. **L. Dusenii** Steph. in Hepat. Afric. in Camerunia a P. Dusén collectae exsicc., sched. No. 247 (*nomen*).

Monoicous. Plant rather small, green or pale-green, densely stratified, corticolous. Stem up to 2 cm. long, sparingly branched. Leaves subopposite, distichously patulous, oblongo-conical, with margins straight, at apex not half as wide as at base, at apex lunately excised, bispinose, the spines being short and nearly of equal size and narrowly triangulate. Leaf-cells 28  $\mu$ , at base 28 by 37  $\mu$ ; trigones minute. Amphigastria three times as wide as the stem, widely lunately excised, on each side bispinose and broadly united with the leaves. Perianths terminal, i.e. not borne on innovations, oblongo-triquetrous, at apex deeply multilaciniate, broadly winged, the wings being irregularly and grossly spinose. Innermost floral leaves little larger than the cauline, at apex truncato-bidentulous, with margins paucidenticulate. Innermost floral amphigastrium small, broadly connate with its proper leaves, subquadrate, quadrilaciniate to half its length, the innermost laciniæ being the stouter. Andrecia terminal on the branches, fusiform; bracts exciso-bifidulous to one-third of their length and inflatedly lobulate on the postical side, the lobules being united with the amphigastrium.

The original specimen was gathered on the Cameroon mountains above the village of Buea at an elevation of about 5200 ft., on the trunks of trees; 13 July 1891 (Dusén No. 247).

**PUNGO ANDONGO.**—Not uncommon in shady *Mimosa*-woods by rivulets near Pedras de Guinga; March 1857. No. 230. Mixed with tufts of mosses in moist clefts of rocks within the præsidium; May 1857. No. 235.

**GOLUNGO ALTO.**—Quisucula, April 1856. No. 277. Widely cæspitose on schistose rocks on the mountains of Alta Queta; March 1859. No. 294. Among mosses (*Ectropothecium*, etc.), in Mata de Quisuculo; Jan. 1856. No. 311.

15. **PLAGIOCHILA** Dumort. Rec. d'Observ. p. 14 (1835).1. **P. amplifolia** Steph. sp. n.

Sterile, rather large, robust, densely depresso-cæspitose, yellowish-green, corticolous. Stem straight, hard, fuscous, up to 3 cm. long, at the top sparingly branched. Leaves fragile, crowded, imbricate, curvately patulous, ovate when flattened, truncate at apex, on the antical side a little decurrent, on the postical side from the very base rotundato-ampliate and very prominently cristate; margin everywhere remotely dentate, the teeth being short and widely triangulate. Cells 25  $\mu$ , at base 17 by 34  $\mu$ ; trigones rather large. The other parts of the plant are wanting.

The original specimen was gathered by Quintas in St. Thomas's Island. The species is to be compared with *P. abyssinica* Mitt.

**PUNGO ANDONGO.**—Barrancos de Catete; Dec. 1856. No. 247.

**GOLUNGO ALTO.**—Without locality; probably Cungulungulo; Feb. or June 1855. No. 276.

2. **P. decurrens** Steph. sp. n.

Dioicous. Plant rather small, slender, densely cespitose, olivaceous. Stem up to 4 cm. long, very much and almost fasciculately branched; branches subsimple and pinnately divided at the top into short floriferous branchlets. Leaves not spreading much from the stem (at an angle of 30°), obliquely oblong, on the postical side shortly inserted, longly incumbent on the stem, on the antical side very longly decurrent, at apex truncate bitridentate, upper margin sparingly dentate, the teeth being widely triangulate and short. Apical cells 17  $\mu$ , median 17 by 25  $\mu$ , basal 17 by 35  $\mu$ ; trigones rather large. Perianth terminal on ultimate branchlets, oblongo-obconic, on one side winged, at apex truncate, closely and equally dentato-spinose, the spines being slender and setaceous at apex. Innermost floral leaves from a narrow base obliquely ovate, at apex subtruncate, margins everywhere grossly crenato-spinose, quite entire at the base only.

The original specimen was gathered by Dusén in the Cameroons. The species is most distinct; it is easily recognised by its very decurrent leaves, and can be compared with no other species hitherto known.

GOLUNGO ALTO.—On old trunks by rivulets in Alta Queta; July 1857. No. 280.

3. **P. divergens** Steph. in Hedwigia, xxx. p. 268 (1891).

GOLUNGO ALTO.—On continually wet rocks by the cataracts of the Cuango river near Sange; Aug. 1855. No. 303. In Mata de Quisucula, near Bango Aquitamba; Jan. 1856. No. 303b.

4. **P. præmorsa** Steph. in Engl. Bot. Jahrb. viii. p. 92, fig. 1-3 (1887).

PUNGO ANDONGO.—On trunks near the ground in Mata da Pedra Pungo; May 1857. No. 234.

GOLUNGO ALTO.—On schistose rocks near the rivulet of Capopé; Oct. 1854. No. 298. In Mata de Quisucula; Feb. 1855. No. 304.

5. **P. strictifolia** Steph. in Hedwigia xxx. p. 210 (1891).

GOLUNGO ALTO.—Among mosses on the banks of the Cuango river; June 1856. No. 221. With *Thuidium gracile* (No. 143), Alta Queta; Jan. 1856. No. 271. On Xipepe (*Monulora angolensis*) and other trees, Alta Queta; March 1856. No. 273. Quisucula; Feb. 1855. No. 290. Mixed with *Eulejeunea Ecklonii* amongst mosses (*Rhynchostegium*, etc.) on rocks on the banks of the Coango river near Sange; June 1856. No. 325. Cataract of the Cuango river; 5 July 1856. No. 326.

6. **P. thomeensis** Steph. in Engl. Bot. Jahrb. viii. p. 81 (1886).

GOLUNGO ALTO.—With *Porotrichum elongatum* (cf. No. 146), Quisucula; Feb. 1856. No. 274. In the woods of Sobado Quilombo; July 1856. No. 291. On trunks of old trees by the side of a rivulet, Zengas da Queta; one specimen found with fr. May 1856. No. 324.

CAZENGO.—On the right bank of the river Luimba, Mata de Muxaúla; Jan. 1855. No. 275.

To this genus are referred the following numbers:

ISLAND OF ST. THOMAS.—Cespitose, intensely green, in company

with various mosses covering rotting trunks in dense woods, Novo Destino; Dec. 1860. No. 266.

GOLUNGO ALTO.—A mere scrap with *Pilotrichella Welwitschii* (No. 145), Cungulungulo, Feb. 1855. No. 269.

16. **FRULLANIA** Raddi in Mem. Soc. Mod. xviii. p. 20 (1820).

1. **F. angulata** Mitt. in Journ. Linn. Soc. vii. p. 169 (1864).

GOLUNGO ALTO.—With *Eulejeunea isomorpha*, Cungulungulo; Feb. 1855. No. 222. Dark purple, or purplish green, springing from the branches of evergreen trees in company with mosses (*Pilotrichella*, etc.) and fruticulose lichens, and then forming long hanging beards 4 to 8 in. in length and very tangled. Dioicous. Involucel large, deeply triquetrous (*i.e.*, with the angles exceedingly prominent), with rostrum straight and rather obtuse, at length split into three almost regularly. Very common on trees in the most elevated woods of Cungulungulo at an altitude of about 2500 to 2700 ft. above sea level; Feb. 1855. No. 285.

2. **F. diptera** G. L. et N. Synops. Hep. p. 420 (1845).

GOLUNGO ALTO.—Rare on bark and sterile in Alta Queta; Jan. 1856. No. 279.

CAZENGO.—On old living trunks in elevated parts on the mountain chain called Muxaúla; June 1855. No. 286.

3. **F. spongiosa** Steph. in Hedwigia, xxxiii. p. 147 (1894).

GOLUNGO ALTO.—Interwoven with *Schlotheimia rugifolia* (No. 132), on a lofty *Morus* in eastern Queta near Sange; Dec. 1854. No. 278.

4. **F. squarrosa** Nees in G. L. & N. Synops. Hep. p. 416 (1845).

AMBRIZ.—Among tufts of *Collema* in rocky woods between Ambriz and Quizembo; Nov. 1853. No. 262.

GOLUNGO ALTO.—On roots or rhizome of *Orchideæ* growing on *Giganthemum scandens*, Mata, Virgem de Quibanga; with abundant fr. No. 282. On old trunks of *Adansonia* near Sange; 17 Feb. 1856. No. 292. Common on the bark of species of *Ficus*, near Sange; with fr. Dec. 1855. No. 297. On trunks of *Pseudospondias microcarpa* in the dense woods of Sobato Mussengue; with fr. beginning of Jan. 1856. No. 301. On *Treculia africana* ("Dizanha"), near Ndelle; Jan. 1856. No. 302. With *Strepsilejeunea pluriplicata* on rather old trunks in Mata de Quisucula near Bango; Jan. 1856. No. 305. Common on aerial roots of *Orchideæ* parasitic on *Giganthemum scandens*, Mata virgem de Quibanga; with fr. Jan. 1856. No. 313. Rather rare on the bark of the tree Musubiri (*Myrianthus arboreus*), Zengas do Queta; March 1856. No. 316. On the aerial roots of *Orchideæ* growing on the branches of *Adansonia* near Sange; Dec. 1855. No. 333.

5. **F. trinervis** G. L. et N. Syn. Hep. p. 427 (1845).

GOLUNGO ALTO.—Mata de Quisucula, near Bango; Feb. 1855. No. 315.

6. **F. (Trachycolea) Welwitschii** Steph. sp. n.

Dioicous? Plant rather small, blackish purple, longly and widely expanded on bark. Stem up to 4 cm. long, with a few long branches at base; branches shortly and densely pinnate. Leaves crowded, widely cordate-ovate, at apex truncato-rotundate somewhat decurved, at the antical base rotundate or a little lobulate, at the back not overlapping the stem. Leaf-cells, marginal 17  $\mu$ , median 17 by 25  $\mu$ , at the very base 25 by 40  $\mu$ ,

very chlorophyllose. Auricle very large, almost reaching the apex of the leaf, almost touching the stem, compresso-semiglobose, at apex shortly acuminate falcato-decurred, with the mouth very wide, gaping, and with the lips not truncate, but more or less curved. Amphigastria very large, contiguous or imbricate, more than thrice the width of the stem, transversely inserted, cuneately narrowed at base, angulate at the sides, incised to one-third at apex, with the sinus straight acute, and the lobules broadly triangular acute. The rest is wanting.

**GOLUNGO ALTO.**—On the bark of tree-trunks in exceedingly shaded spots on the mountains of Alta Queta : Oct. 1851. No. 299.

Very like *F. squarrosa* in habit and size, but differing from that species in its leaves, which are not squarrose, and in its very large auricles.

To this genus belongs the following imperfect specimens :

**PUNGO ANDONGO.**—Creeping, pulvinately interwoven, densely clothing stems and branches of *Villosia*, in the living state fuscous-green or golden-green, Pedra de Casamba ; beginning of May 1857. No. 240.

**HUILLA.**—Very small, with stem and leaves fuscous-purple ; on the bark of *Sapotaceæ*, on the tree called in the vernacular "Mtambote" (*Chrysophyllum aegyptiophyllum*), interwoven with *Brachycaudium angolense*, etc., in the more elevated parts of Morro de Lopollo ; end of March 1860. No. 251.

**17. LEJEUNEA** Lib. in Ann. Gén. Sc. Phys. vi. p. 372 (1820).

1. **L. (Acrolejeunea) confertissima** Steph. in Hedwigia xxvi. p. 165, t. xiii. f. 25-28 (1892).

**PUNGO ANDONGO.**—Sparingly on old trunks of palms (*Elaeis guineensis* in cultivation) near Candumba in the valley of the river Cuanza : March 1857. No. 231. Growing among *Physiot leucomelas*, on volcanic rocks near Cazella within the praeidium ; Feb. 1857. No. 249.

**AMBRIZ.**—In company with mosses, etc., among tufts of *Collomia* in rocky woods between Ambriz and Quisembo, on the right bank of the river Loge : Nov. 1853. No. 261.

2. **L. (Acrolejeunea) Pappeana** Nees in G. L. et N. Synops. Hep. p. 296 (1845).

*Acrolejeunea Pappeana* Steph. in Hedw. xxviii. p. 166 (1889).

**GOLUNGO ALTO.**—On living trunks of trees in elevated parts of Cungulungulo : Feb. 1855. No. 281. In the woods of Sobaldo Quilombo : July 1856. No. 287.

3. **L. (Cololejeunea) crenatiflora.**

*Cololejeunea crenatiflora* Steph. in Hedw. xxx. p. 270, t. xxxiii. xxxiv. f. 11, 12 (1891).

**ISLAND OF ST. THOMAS.**—On the fronds of ferns : Dec. 1860. No. 265

4. **L. (Eulejeunea) Breutelii.**

*Eulejeunea Breutelii* Steph. in Hedw. xxxv. p. 85 (1896).

**GOLUNGO ALTO.**—On trunks of trees in the woods of central Queta (Serra do Alta Queta) : July 1855. No. 220.

5. **L. (Eulejeunea) Eckloniana** G. L. et N. Synops. Hep. p. 381 (1845).

GOLUNGO ALTO.—With *Plagiochila strictifolia* and *Rhynchostegium* on rocks on the banks of the Coango river, near Sange ; June 1856. No. 325.

6. **L. (Eulejeunea) flava** Spruce in Trans. Bot. Soc. Edinb. xv. p. 268 (1884).

PUNGO ANDONGO.—On branches of *Xerophyta squarroso* within the praeedium ; May 1857. No. 250.

GOLUNGO ALTO.—On living and withering branches of various shrubs and trees by the Coango river, near Sange ; Aug. 1855. No. 296.

PRINCE'S ISLAND.—Growing on trunks of palms (*Elaeis guineensis*), on the ascent of M. de Papagaio ; Sept. 1853. No. 264.

7. **L. (Eulejeunea) isomorpha** Gottsche in Abh. Nat. Ver. Bremen. vii. p. 355, adnot. (1882).

GOLUNGO ALTO.—Creeping among plants of *Frullania angulata*, Cungulungulo ; Feb. 1855. No. 222. On moss No. 128 (*Cryphaea Welwitschii*) on the highest parts of Cungulungulo ; Feb. 1855. No. 268. Growing on *Cryphaea Welwitschii* in the woods of Sobado de Mussengue, but rare ; May 1855. No. 284. Densely cespitose, whitish glanco-flavescens, growing on soil and rocks ; rare on soil on the rocks of Mata de Quisquela ; Feb. 1855. No. 288.

#### 8. **L. (Eulejeunea) Jungneri.**

*Eulejeunea Jungneri* Steph. in Hedw. xxxv. p. 80 (1896).

PRINCE'S ISLAND.—On fronds of *Asplenium* in rather elevated parts of the island, at an altitude of 1200 ft. : Sept. 1853. No. 263.

To the subgenus *Eulejeunea* may be referred the following sterile specimens :—

GOLUNGO ALTO.—Mixed with *Rhynchostegium* in tufts of *Racopilum tomentosum* (No. 165) on rocks by the banks of the Coango river, near Sange ; June 1856. No. 223. With the same mosses at the same spot : middle of June 1856. No. 295. Growing with *Rhynchostegium* at the waterfall of the Coango, near Sange ; 5 July 1856. No. 224. With *Fissidens angolensis* on rocks of mica-schist near Fonte de Capopa ; Dec. 1855. No. 270.

PUNGO ANDONGO.—On moist earthy humus by cataracts of rivulets near Pedra Cabondo, but very scarce ; beginning of May 1857. No. 241.

9. **L. (Lopholejeunea) Sagræana** G. L. et N. Synops. Hepat. p. 314 (1845) ; Spruce in Trans. Bot. Soc. Edinb. xv. p. 120 (1884) (*Lopho-Lejeunea*).

*Phragmicomia Sagræana* Mont. in Ramon de la Sagra Hist. Phys. Cuba Bot. ii. p. 464 (1842), t. xviii. f. 1.

PUNGO ANDONGO.—On rotting trunks in Mata da Pedra Pungo ; April 1857. No. 225. On trunks of palms (*Elaeis guineensis* under cultivation) near Candumba, in the valley of the river Cuanza ; March 1857. No. 227.

No. 227 is a small and imperfect specimen referred with doubt to this species.

10. **L. (Lopholejeunea) subinermis** Steph. in Engl. Bot. Jahrb. xx. p. 318 (1895).

PUNGO ANDONGO.—Interwoven with *Thuidium tenuissimum* (No. 51), Barranco Grande de Catete ; middle of May 1857. No. 218.

To the subgenus *Lopholejeunea* is referred the following sterile specimen:—

PUNGO ANDONGO.—Glaucous, creeping, laxly cespitose, on rotting trunks and also on moist ground, Barranco de Songue : middle of May 1857. No. 243.

11. **L. (Strepsilejeunea) pluriplicata.**

*L. (Anomalolejeunea) pluriplicata* Spruce ex Pearson in Christiania Vidensk. Selsk. Forh. 1887, No. 9 (Hepat. Kynsuan.), p. 5, t. ii.

GOLUNGO ALTO.—With *Frullania squarrosa* on rather old trunks, Mata de Quisnuela, near Bango : Jan. 1856. No. 305.

Under *Lejeunea* should be placed the following sterile specimen:

PUNGO ANDONGO.—Frequent on submerged stones and roots of trees in the rivulet Casalalé, near Pedra Songue within the præsidium, end of Feb. 1857. No. 314.

18. **RADULA** Dumort. Syll. Jng. Eur. pp. 24, 37 (1831) : Rec. d'Observ. p. 14 (1835).

1. **R. epiphylla** Mitt. ex Steph. in Hedw. xxiii. p. 151 (1881).

GOLUNGO ALTO.—In company with *Fissidens glaucissimus* (No. 141) and *Alsophila aethiopica* Welw. on moss-clad rocks in the primitive woods of Quisnuela : July 1857. No. 272. Creeping on the leaves of *Ceratthura (Rinorea dentata* Herb. Welw. No. 894) near Zengas de Queta : July 1856. No. 300. With *Fissidens glaucissimus*, Quisnuela : July 1857. No. 331.

19. **MADOTHECA** Dumort. Comm. Bot. p. 111 (1823).

1. **M. subdentata** Mitt. in Journ. Linn. Soc. vii. p. 167 (1861).

PUNGO ANDONGO.—Barrancos de Catete : Dec. 1856. No. 233. On moist, shaded rocks, Pedra Songue : April 1857. No. 239. Interwoven with tufts of moss No. 101 (*Thuidium revolutum*), etc., Barrancos de Catete : beginning of Dec. 1856. No. 248.

20. **JUNGERMANNIA** Mich. Nov. Pl. Gen. p. 6 (1729).

To this genus are referred two specimens which are sterile and in bad condition.

PUNGO ANDONGO.—On rocks submerged during the rainy season for one or two months in the Tangue river, near Catete : May 1857. No. 242.

HUILLA.—In company with *Utricularia*, etc., in rather elevated swampy places in the Monino district : April 1860. No. 254.

21. **ANTHOCEROS** Mich. Nov. Pl. Gen. p. 10 (1729).

1. **A. communis** Steph. in Bull. Herb. Boiss. v. p. 86 (1897).

PUNGO ANDONGO.—Widely cespitose, intensely green, with a fleshy deeply lobed frond ; common by springs in shaded rocky places near Catete ; with fr. May 1857. No. 228.

GOLUNGO ALTO.—Rio Múo, Quilombo : July 1856. No. 293. Fronds rather fleshy, dark green : always in company with *Marchantia* but not common ; on rocks and soil by the cataracts of the Capopa spring ; with fr. end of Aug. 1855. No. 318.

HUILLA.—In company with *Eriocaulon*, *Burnatia*, and *Agyriea*.

in the more elevated wet swampy woody places at an altitude of 5000 ft. ; with fr. April 1869. No. 253.

22. **NOTOTHYLAS** Sulliv. Musci Alleghan. p. 69 (1846).

1. **N. angolensis** Steph. sp. n.

Dioicous. Plant large, green, depresso-caespitose. Frond 10 mm. long, from a narrow base widely obconic, at apex thick, lobulate, very crispate. Costa very longly radicellose, abruptly produced, yet shallow; wings of the frond longly attenuate. Capsules arising from the margin of the frond, procumbent, from a very small conical inserted bulb cylindrical, acuminate, obtuse, ascending in a curve, with walls thick, formed of short very incrassate cells; stomata none. Spores  $34\ \mu$ , flavescent, smooth; elaters a little smaller than the spores, with the spiral fibre reduced to three lamellæ which run round the wall meridionally. Anthers unknown. Involucræ large, 3- or 4-winged superficially with minute lamellæ, especially rough on the wings.

PUNGO ANDONGO.—Velvety green, flabellately applied to the ground in swampy places, which were becoming dry, between Condo and Quisonde, at an altitude of about 3000 ft. ; with perfect fr. 12 March 1857. No. 232.

The plants are very crowded in growth, the younger fronds running over the old ones in all directions; they are very thin at the base and stout and fleshy in the upper part of the frond; the margin bears numerous small and crisped lobes, particularly about the growing point, which lies safely buried under them, in the deep cleft of the apex. This species is a near ally of *N. decurra* Mitten, and differs from that species in the size and thickness of the frond. The size and sculpture of the spores of *N. decurra* are not stated by the author.

2. **N. flabellata** Steph. sp. n.

*Anthoceros flabellatus* Welw. ms.

Monocious. Plant very large, densely stratified, green at apex, elsewhere flavo-rubescens. Frond up to 3 cm. long, repeatedly furcate, with the forks very thin (3 to 4 cells thick), with the margin remotely pinnate; pinnae small, minutely pinnulate; the whole frond exceedingly irregular, as though coarsely lacerated, formed of large cells, without cavities. Capsules solitary or in pairs, arising from the margin of the frond, which is always innovated from the base of the involucræ, small (1 mm. long), clavate, with a large inserted basal bulb; involucræ smooth, very thin, of oblique growth, completely enveloping the capsule, as in the other members of the genus. Valves formed of very long, very incrassate and very fragile cells; stomata none. Spores small ( $25\mu$ ), under the microscope brown, minutely rough. Elaters very short (28 by  $34\mu$ ), more than twice as large as the spores, sub-hyaline, bispirous, with the spirals laxly coiled. Anthers solitary? in a large cavity.

PUNGO ANDONGO.—Plant orbicular, 1 to 4 in. wide, bright green, with fruits bright orange shining as if varnished: on wet rocks by the rivulet of Casalalé within the præsidium, at an elevation of about 3000 ft. : with perfect fr. May 1857. No. 131.

A very curious plant, the largest of the genus, extremely thin and very much branched, quite unlike any other species of *Notothylas*. The involucrum of the capsule is decumbent, being inserted on one side, but for a very short distance only; very curious also is the innovation of the frond from the base of the fruit, quite a new feature in this class of plants, of which the terminal cells are used up for the formation of the pistillidia. The elaters are formed inside a mother-cell (just like the spores, 4 together) and are real tetrahedrons; but they lose their form and become inflated by the action of the spiral bands, as soon as they are set free.

*Notothylas* has always numerous pistilla within one flower; the occurrence of 2 capsules springing from the same point is therefore not surprising, though it has never before been observed.

## CHARACEÆ.

The Characeæ of Welwitsch's Herbarium were determined by Alexander Braun and included in his "Characeen Afrika's" (in Monatsber. Preuss. Akad. Wissensch. Dec. 1867, pp. 782-800, 873-944; Berlin 1868). A few subsequent modifications appeared in Braun's posthumous "Fragmente einer Monographie der Characeen," edited by Dr. Otto Nordstedt in Abhandl. Königl. Akad. Wissensch., pp. 211, tt. 7; Berlin 1882.

1. **NITELLA** Agardh Syst. Algar. p. xxvii. (1824).

1. **N. leptoclada** A. Br. in Berlin. Monatsber. Preuss. Akad. Dec. 1867, p. 880 (1868).

**HUILLA**.—In company with species of *Ottelia* and *Blyxa* in very deep woodland ponds near Lopollo, at the spot where the Munanos pitched their camp: with fr. May 1860. No. 499.

**LOANDA**.—Rather rare at the sides of deep rain-water pools near the country house (Museque) of Luiz Gomes in the plain above Loanda (not seen by Welwitsch in 1853-4); with unripe fr. 10 Jan. 1858. No. 495.

2. **N. huillensis** A. Br. et Welw. in Berlin, Monatsber. Preuss. Akad. Dec. 1867, p. 892 (1868); confer tab. vi. fig. 164 in Berlin. Akad. Abhandl. 1882.

**HUILLA**.—Growing in mud or on small stones under running water; fronds cæspitose, monosiphonous, shining when dry; ramifications bearing fruit, and coated with a hyaline substance of a Nostochoid-brown appearance, and fused into a globule. Common in the Mupanda rivulet, which flows into Lake Ivantâla; also in the Ema rivulet in Monino; with fr. 1 March and 11 April 1860. No. 496.

2. **CHARA** Vaill.; Agardh. Syst. Algar. p. xxvii. (1824).

1. **C. fœtida** A. Br. in Ann. Sci. Nat. Sér. 2. I. p. 354 (1834); Flora xviii. i. p. 63 (1835).

Var. **subinermis** A. Br. Schweiz. Charac. p. 23 in Schweiz. Gesellsch. Neue Denkschr. x. (1849); in Berlin. Monatsber. Preuss. Akad. Dec. 1867, p. 942.

**MOSSAMADES**.—In ponds alongside the banks of the river Bero near the town of Mossamedes: a single specimen, June 1859. No. 500. In pools by the banks of the river Caroca (Croque) near Cabo Negro (16° S. lat.), 12 geographical miles' distance from the mouth of the river; abundant in the river near S. João de Croque; with fr. 2 Sept. 1859. No. 498. Growing in company with *Marsilea*, and mixed with a few fragments of *Chara angolensis*, in small sluggish streams, entirely

dried up in winter, between Mossamedes and Cavalheiros—a rare plant: July 1859. No. 497.

PUNGO ANDONGO.—Common in a salt stream in Sobato de Dungo, not far from Quitage: in company with *Ruppia*: end of March 1857. No. 492.

2. *C. brachypus* A. Br. in Hook. Journ. Bot. 1849, p. 298; in Berlin. Monatsber. Preuss. Akad. Dec. 1867, p. 939.

LOANDA.—Excessively fragile: obscure green during life, and growing not in thick crops (as is usual with Charas) but in isolated tufts. Not uncommon at the margins of rain-water ponds near Quicúxe in the plain of Loanda: beginning of May 1851. No. 494.

3. *C. gymnotus* A. Br. Schweiz. Charac. p. 23 in Schweiz. Gesellsch. Neue Denkschr. x. 1849 (*nomen*); in Berlin. Monatsber. Preuss. Akad. Dec. 1867, p. 942.

Var. *angolensis* A. Br. Fragmente Monogr. Charac. edid. Nordstedt in Berlin. Akad. Abhandl. 1882, p. 191.

*C. angolensis* A. Br. in Berlin. Monatsber. Preuss. Akad. Dec. 1867, p. 943.

BARRA DO BENGÓ.—Not uncommon in the barely salt waters of the great lake of Quisequêle below Quifandongo at the mouth of the river Bengo: Dec. 1853. No. 493.

MOSSAMEDES.—In small quantity mixed with *C. fistula* var. *subinermis* in small slowly running streams quite dried up in winter, between the town of Mossamedes and Cavalheiros: July 1859. No. 497.

# MARINE ALGAE.

BY ETHEL S. BARTON.

## CYANOPHYCEÆ.

1. **HYELLA** Born. & Flah. in Morot, Journ. de Bot. 1888, ii. 162.

1. **H. cæspitosa** Born. & Flah. *l.c.*

LOANDA.—Near the shore : March 1854. No. 36.

## CHLOROPHYCEÆ.

1. **ULVA** L. Gen. 326.

1. **U. Lactuca** L. Sp. Pl. ii. p. 1163.

LOANDA.—On the shore ; Feb. 1854. Near S. Pedro ; July 1854 No. 33.

2. **U. fasciata** Del. Egypt vol. ii. p. 297.

LOANDA.—On rocks of the sea near S. Pedro, Morro de Lagostas, frequent ; Feb. and July 1854. No. 34.

2. **ENTOCLADIA** Reinke in Bot. Zeit. 1879, 476.

1. **E. viridis** Reinke, *l.c.*

LOANDA.—In *Nitophyllum* : July 1854. No. 100.

3. **DASYCLADUS** Ag. in Reg. Flora, 1827, ii. 640.

1. **D. clavæformis** Ag. *l.c.*

MADEIRA.—Funchal. No. 266.

4. **CAULERPA** Lam. in Desv. Journ. Bot. ii. 141.

1. **C. Selago** Ag. Sp. Alg. p. 442.

ST. VINCENT, CAPE DE VERDE.—On rocks covered by volcanic sand : Aug. 1853. No. 214.

2. **C. scalpelliformis** Ag. Sp. Alg. p. 437.

LOANDA.—S. Pedro ; Feb. 1854. No. 46.

ISLAND OF ST. THOMAS.—On the shore of the island (below the equator), together with *Codium tomentosum* : Dec. 1860. No. 262.

3. **C. clavifera** Ag. Sp. Alg. p. 437.

ST. VINCENT, CAPE DE VERDE.—Very rare on rocks covered with volcanic sand, Porto de Mindello : 22 Aug. 1853. No. 215.

5. **CODIUM** Stackh. Ner. Br. p. xvi.

1. **C. elongatum** Ag. Sp. Alg. p. 154.

LOANDA.—Thrown up on the shores of the island, near S. Pedro : Oct. 1853 ; Feb. and May 1854. No. 48.

2. **C. tomentosum** Stackh. Ner. Br. p. 24.

LOANDA.—Frequent : Feb. 1854. No. 47.

6. **HALIMEDA** Lam. in Nouv. Bull. Soc. Philom. Nov. 1812, 186.

1. **H. Tuna** Lam. Hist. Polyp. fl. p. 309.

ST. VINCENT, CAPE DE VERDE.—Rare on basaltic shore : Aug. 1853. No. 247.

### PHLEOPHYCEÆ.

1. **CYSTOSEIRA** Ag. Sp. Alg. i. 50.

1. **C. Abies-marina** Ag. Sp. Alg. i. p. 54.

ST. VINCENT, CAPE DE VERDE.—Rather frequent and well-developed on volcanic rocks near Praia de Galé ; 20 Aug. 1853. No. 221.

2. **PADINA** Adans. Fam. des Plantes, pt. ii. 13.

1. **P. Pavonia** Gaill. Diet. Class. Nat. vol. xii. p. 589.

LOANDA.—On rocks close to the shore of the ocean near S. Pedro. frequent : Feb. and July 1854. No. 40.

ST. VINCENT, CAPE DE VERDE.—Thrown up near Praia de Galé : Sept. 1853. No. 210.

3. **DICTYOTA** Lam. in Desv. Journ. Bot. ii. 38.

1. **D. dichotoma** Lam. Essai p. 58.

PRINCE'S ISLAND.—On rocks of the ocean, not infrequent, close to the shore. Bahia de S. Antonio ; 20 Sept. 1853. No. 258.

4. **HYDROCLATHRUS** Bory in Diet. Class. viii. 1825, 419.

1. **H. cancellatus** Bory, *l.c.*

LOANDA.—Thrown up by the Atlantic at Praia de Gamba, frequent : 4 Dec. 1853 ; 3 Feb. 1854. No. 45.

5. **COLPOMENIA** Derb. & Sol. Mém. Phys. Alg. II.

1. **C. sinuosa** Derb. & Sol. *l.c.*

LOANDA.—Thrown up by the ocean near S. Pedro, very rare. No. 44  
MADEIRA.—Funchal, 1852. No. 265.

### FLORIDEÆ.

1. **GALAXAURA** Lam. Polyp. Flex. 259.

1. **G. fragilis** Dene. Corall. p. 104.

Very frequent on the shores of St. Vincent, Cape de Verde, thrown up by the sea in great abundance.

ISLAND OF ST. VINCENT, CAPE DE VERDE.—On volcanic rocks near Praia de Galé, especially frequent ; 21 Aug. 1853. No. 220.

2. **G. obtusata** J. Ag. Sp. Alg. vol. iii. pt. 1, p. 525.

LOANDA.—1854. No. 275.

2. **CAULACANTHUS** Kütz. Phyc. Gen. 395.1. **C. ustulatus** Kütz. *l.c.*

MOSSAMEDES.—Very frequent on calcareous rocks of the sea near Mossamedes ; July 1859. No. 76. Frequent on calcareous and sand-stone submarine rocks near Mossamedes ; July 1859. No. 77.

ST. VINCENT, CAPE DE VERDE.—On the shore, Praia de Galé : Aug. 1853. No. 230.

3. **GELIDIUM** Lam. in Ann. Mus. Hist. Nat. Paris, xx. 1813, 128.1. **G. corneum** Lam. *l.c.*

BENGUELLA.—On Patellæ thrown up by the Atlantic near Benguella ; June 1859. No. 75.

LOANDA.—On rocks near S. Pedro, frequently covering all the rocks : July 1854. No. 50.

4. **GIGARTINA** Lam. in Ann. Mus. Hist. Nat. Paris, xx. 1813, 134.1. **G. Teedii** J. Ag. *l.c.*

LOANDA.—Morro das Lagostas, rare ; July 1854. No. 117.

5. **FLAHAULTIA** Born. Alg. Schousb. 278.1. **F. palmata**. Barton in Journ. Bot. 1897.

LOANDA.—Frequent near Morro das Lagostas ; Jan. 1854. No. 65. Angola, Fort Conceição ; July 1854. Nos. 78, 80. On shells and rocks near Morro das Lagostas, frequent ; Jan. 1854. No. 99.

6. **GRACILARIA** Grev. Alg. Brit. 121.1. **G. confervoides** Grev., *l.c.*, p. 123.

LOANDA.—Thrown up on the island, rare ; Jan. 1854. No. 95.

7. **HYPNEA** Lam. in Ann. Mus. Hist. Nat. Paris, xx. 131, 1813.1. **H. musciformis** Lam., *l.c.*

LOANDA.—When living, mostly pale brown and fragile ; when thrown up and exposed to the air it becomes flaccid and of a red, purple, and orange colour, variegated. Fruit occurs rarely. Frequent and of various forms on rocks, shells and other algæ on the shores of Loanda, where large quantities are thrown up. On coralline rocks near S. Pedro ; July 1854. No. 84.

ST. VINCENT, CAPE DE VERDE.—On volcanic rocks and on other algæ on the shore, frequent. Praia de Galé : Aug. 1853. No. 250.

8. **RHODYMENIA** J. Ag. Alg. Liebm. 15.1. **R. palmetta** Grev. Alg. Brit. p. 88.

LOANDA.—On rocks at Morro das Lagostas ; Jan. 1854. No. 115.

9. **CHRYSY MENIA** J. Ag. Alg. Med. et Adriat. 105.1. **C. uvaria** J. Ag., *l.c.*, p. 106.

ST. VINCENT, CAPE DE VERDE.—On the shores. When alive, rose-purple, wine-colour ; Aug. 1853. No. 240.

10. **PLOCAMIUM** Lam. Ann. Mus. Hist. Nat. Paris, xx. 137, 1813.1. **P. coccineum** Lyngbye, Tent. Hydrophyt. Dan. p. 39.

ST. VINCENT, CAPE DE VERDE.—On volcanic rocks near Praia de Galé ; 21 Aug. 1853. No. 241.

11. **ACANTHOPHORA** Lam. in Ann. Mus. Hist. Nat. Paris, xx. 132, 1813.

1. **A. Thierii** Lam., *l.c.*

LOANDA.—On shells near the shore of the island Loanda and Ilha dos Passeros; Jan. and April 1854. No. 112. Loanda; Oct. 1853. No. 113. On oyster-shells near Cabo Lombo; 28 Nov. 1853. No. 114.

12. **POLYSIPHONIA** Grev. Flora Edin. 308.

1. **P. elongata** Hary. in Hook. Brit. Flora p. 333.

LOANDA.—On rocks on the Atlantic shores of Loanda near Fort S. Pedro and Coneiçao, frequently thrown up; Dec. 1853 and Jan. 1854. No. 52.

2. **P. pennata** J. Ag. Alg. Med. p. 141.

LOANDA.—On rocks of the Loanda shore near Fort S. Pedro; Feb. 1854. Penedo, July 1854. No. 96.

13. **BOSTRYCHIA** Mont. in Sagra Hist. Cuba, Paris, 1838-42, 39.

1. **B. tenella** J. Ag. Sp. Alg. vol. ii. pt. 3, p. 369.

LOANDA.—On trunks of *Rhizophora Mangle* immersed at high water, near Cabo Lombo, on the shores of Loanda, occurring rarely, but always broadly cespitose, covering the trunks exactly like a *Hypnum*; 29 Nov. 1853. Nos. 59, 60.

14. **SPYRIDIA** Hary. in Hook. Br. Fl. ii. pt. i. 1833, 336.

1. **S. aculeata** Kütz. Phyc. Gen. p. 377.

ST. VINCENT, CAPE DE VERDE.—22 Aug. 1853. No. 217.

2. **S. clavata** Kütz. in Linn. 1841, p. 744.

LOANDA.—On the shore, thrown up by the ocean; this one specimen near Fort de Coneiçao; Jan. 1854. No. 58.

15. **CERAMIUM** Roth, Cat. Bot. iii. 106.

1. **C. diaphanum** Roth., *l.c.*, p. 154.

LOANDA.—Morro das Lagostas, on a species of *Hypnea*, etc.; Jan. 1854. Nos. 67, and on 65.

16. **CENTROCERAS** Kütz. in Linnaea, 1841, 741.

1. **C. clavulatum** Mont. Fl. Alg. p. 140.

LOANDA.—On rocks covered by sand on the shore near Fort de Coneiçao; Dec. 1853. No. 61. Near S. Pedro; Feb. and April 1854. No. 64. On rocks of the sea near Morro das Lagostas and S. Pedro, frequent; Jan. 1854. No. 66.

17. **PEYSSONELIA** Dene. Pl. Arab. 168.

1. **P. rubra** J. Ag. Sp. Alg. ii. p. 502.

LOANDA.—On rocks and various algae, Praia de Penedo; Jan. and Feb. 1854. No. 121.

ISLAND OF LOANDA.—May 1854. No. 123.

ST. VINCENT, CAPE DE VERDE.—On rocks and various algae near volcanic rocks, but rarely well developed; 22 Aug. 1853. No. 233.

PRINCE'S ISLAND.—On rocks in the Atlantic, here and there, growing gregariously; 21 Sept. 1853. No. 256.

2. **P. Harveyana** Crn. in J. Ag. Sp. Alg. vol. ii. pt. 2, p. 501.

LOANDA.—Morro das Lagostas ; July 1854. No. 122.

ST. VINCENT, CAPE DE VERDE.—Praia de Galé ; 22 Aug. 1853. No. 236.

18. **GRATELOUPIA** Ag. Spec. Alg. i. 221.

1. **G. lanceola** J. Ag. Sp. Alg. vol. ii. pt. i. p. 182.

LOANDA.—Fronds gregarious, chiefly covering the sides of rocks and stones ; fertile plants always much branched, when sterile smaller. Colour when alive a dark steely purple Hab. on the Angola shores near Morro das Lagostas, rare, on rocks ; July 1854. No. 120.

19. **MELOBESIA** Lam. Hist. Polyp. Flex. 313.

1. **M. corticiformis** Kütz. Sp. Alg. p. 696.

ST. VINCENT, CAPE DE VERDE.—On the fronds of *Gelidium rigidum* on the shore : Aug. 1853. No. 251.

20. **CORALLINA** Lam. Polyp. fl. p. 275.

1. **C. officinalis** Lam. Fauna Suec. n. 2234.

MADEIRA.—Praia de Camara dos Lobos ; Aug. 1853. No. 268.

A certain number of the algae collected by Dr. Welwitsch are not sufficiently well preserved to be named specifically, and are therefore not given here. Among these are species of *Cyanophyceæ*, *Cladophora*, *Sargassum*, *Dictyota*, *Corallineæ*, *Gracilaria*, *Poly-siphonia*, and *Nitophyllum*.

# FRESHWATER ALGAE.

DETERMINED BY

W. WEST, F.L.S., AND G. S. WEST, B.A., A.R.C.S.

The algae which form the subject of this paper were collected some forty years ago by Dr. Welwitsch during his eight years' residence in Angola. They are chiefly from the latter region, but a few are from Banguella and Sierra Leone. The specimens are all dried ones, and for the most part are mounted on paper. Portions of all had to be soaked out for investigation, the results of which have been very gratifying, as by this means, after a detailed examination, many of the smaller species have been observed. These latter, however, had not been collected as such, but, independently entangled among other conspicuous species, had been collected with them. The Desmids had practically all been unconsciously obtained in this way, few, if any, collections having been made from places in which one would expect to find Desmids in abundance; and yet about 130 fine species (including fifty undescribed ones) have been found as intruders amongst other algae. From these mere samples one is led to wonder as to the richness of the Desmid-flora of Tropical Africa.

Very little is known concerning the Freshwater Algae of Africa, only a few small scattered papers having as yet been published; and this extensive collection—one in which almost all the groups are represented—very considerably enlarges our knowledge of the geographical distribution of these plants.

At the time these algae were collected the great majority of the species were as yet undescribed. They form part of the Welwitsch collection deposited in the British Museum, and the numbers after the species refer to the numbers on the sheets of this collection. A few of the species can hardly be considered as freshwater ones, but as they were in the collection we have included them.

It is interesting to note that the earliest collection of algae made in Africa has been found to be more extensive and representative than any hitherto described. The species are localised under the various districts of the region, exactly as indicated by Welwitsch on his herbarium labels. (Ex Journ. Bot. 1897, pp. 1, 2.)

## FLORIDEÆ.

## I. BATRACHOSPERMEÆ.

## 1. BATRACHOSPERMUM Roth (1800).

1. **B. angolense** W. et G. S. West in Journ. Bot. 1897, p. 2.  
*Lemanea angolensis* Welw. in Herb.

PUNGO ANDONGO.—Freq. ast unico loco ad rupe submersa in rivulo de Cabondo socialis cum Podostemaceis; med. Feb. 1857. No. 1.

This may well be taken at first sight for a *Lemanea* with very numerous nodes, the short lateral branches which clothe the axes of the filaments being so very dense and of such uniform length that a surface view appears almost parenchymatous. The filaments are not much thicker at the nodes than between them.

2. **B. nigrescens** W. et G. S. West in Journ. Bot. 1897, p. 2.

PUNGO ANDONGO.—Freq. ast unico loco in brachio laterali flum. Cuanza prope ejus cataract. ad Condo; March 1857. No. 2.

This is a rather noteworthy species, being so much branched that in well-developed specimens the branches aggregate to form narrow pencils; the plant when dry is almost black, and looks like some of the marine *Florideæ*.

3. **B. gracillimum** W. et G. S. West in Journ. Bot. 1897, p. 2.

PUNGO ANDONGO.—Ad lapides submersas in rivulo de Tangue; May 1857. No. 3.

This very beautiful species is characterized by its numerous elongate and delicate branches, which bear the short uniform lateral branches evenly without interruption along their whole length. The globose clusters of lateral branches, which are developed on every 7th to 12th node, are no doubt connected with the fructification; their terminal cells are of a different form from the others, being larger and mostly subglobose. The axis of the filament does not pass through the centre of this dense mass of branches, but the attachment of the globular mass is at one side of the node from which they arise.

4. **B. huillense** Welw. ex W. et G. S. West in Journ. Bot. 1897, p. 3.

HUILLA.—Freq. ad rupe lapidesque submersas in rivulis prope Lopollo; May 1860. No. 4. Also fragments from No. 187.

This species is well marked by its peculiar and dense branching, specimens dried on paper appearing hypnoid. It reminds one of a delicate *B. atrum* Harv., except as to its branching. This species and *B. gracillimum* adhere very well to paper, while *B. nigrescens* and *B. angolense* adhere but slightly.

## II. HILDENBRANDTIACEÆ.

## 1. HILDENBRANDTIA Nardo (1845).

1. **H. rivularis** J. Ag. Species Algar. ii. 495; Rabenh. Fl. Europ. Alg. iii. 408; W. et G. S. West in Journ. Bot. 1897, p. 3.

GOLUNGO ALTO.—Maculis magnis belle sanguineis rupe siliceo-arenosas juxta Fontem de Capopa ornat; Sept. 1855. No. 149.

2. **H. angolensis** Welw. ex W. et G. S. West in Journ. Bot. 1897, p. 3.

GOLUNGO ALTO.—Ad silices in rivulis sylv. primit. de Quibanga pr. Sange; June 1857. No. 150 (I and II.). Welwitsch remarks that the rocks were of a most beautiful rose-colour for half an hour's walk along the stream.

## CHLOROPHYCEAE.

### III. OEDOGONIACEAE.

#### 1. BULBOCHÄTE Ag. (1717).

1. **B. angulosa** Wittr. & Lund. in Wittr. Prodr. Monogr. Edog. 45 (1874); W. et G. S. West in Journ. Bot. 1897, p. 4.

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

In these African plants the oogonia were under the androsporangia and were rotundo-rhomboid, with the superior margins straight (not retuse): the nannandria were not epigynous, but scattered.

#### 2. OEDOGONIUM Link (1820); Wittr. em.

1. **O. cryptoporum** Wittr. Dispos. Edog. Snee. 19 (1870); W. et G. S. West in Journ. Bot. 1897, p. 4.

LOANDA.—Represa do Maghelano pr. Boa vista: Feb. 1854. No. 194

#### 2. **O. crispum** Wittr. Prodr. Monogr. Edog. 10 (1874).

Var. **uruguayense** Magn. & Wille. Bidrag til Sydamerik. Alg. fl. 39, t. ii, fig. 63 (1884); W. et G. S. West in Journ. Bot. 1897, p. 4.

LOANDA.—Represa do Maghelano pr. Boa vista, c. *O. cryptoporum*: Feb. 1854. No. 194.

3. **O. gracillimum** Wittr. & Lund. in Wittr. Prodr. Monogr. Edog. 15 (1874).

*Forma major* W. et G. S. West in Journ. Bot. 1897, p. 4

HUILLA.—In udis sylvaticis et apriis inter Monino et lie. Ivantala, c. *Porphyrosiphone Notarisii* Kutz.: April 1860. No. 14.

4. **O. Itzigsohnii** De Bary. Ueb. Edog. und Bulb. 56, t. iii, fig. 29-32 (1864); Wittr. Prodr. Monogr. Edog. 16 (1874).

Var. **minor** West. Notes on Seotech Freshw. Alg., Journ. Bot. 1893, p. 97; W. et G. S. West in Journ. Bot. 1897, p. 4.

PUNGO ANDONGO.—Freq. c. *Scytommata Myochrous* Ag. var. *chorographica*, temp. pluv. (i.e. Dec. usque Apr.) late vegetans, ad Pedras negras in summis rupibus Praesidi: Feb. 1857. No. 6.

The specimens were even a little smaller than those originally described from the Orkney Isles.

5. **O. huillense** W. et G. S. West in Journ. Bot. 1897, p. 5, t. 365, f. 7, 8.

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

The nearest species to this is *O. matumiforum* Wittr. (Prodr. Monogr. Edog. 16), from which it differs in having eight equal processes round the subrhomboid oogonia, and in the globose oospores.

6. **OE. Rothii** (Le Cl.) Pringsh. Beitr. zur Morph. d. Oedog. i. 69, t. v. fig. 4 (1858); Wittr. Prodr. Monogr. Oedog. 18 (1874).

*Forma major* W. et G. S. West in Journ. Bot. 1897, p. 5.

PUNGO ANDONGO.—Alga late viridis parce vel submucosa, ad ramulos Podostemacearum (*Tristicha trifaria* Tul.) in rivulis Praesidii (Casalalé) ; March 1857. No. 105.

The small obovate nanundria occurred singly or 2-4 on the under side of the oogonia.

7. **OE. hormosporum** W. et G. S. West in Journ. Bot. 1897, p. 5.

HUILLA.—Alga lubrica, viridis, socialis cum *Nitella* sp. in stagnis pr. Catumba ; April 1860. No. 189.

8. **OE. Welwitschii** W. et G. S. West in Journ. Bot. 1897, p. 5.

LIBONGO.—Freq. circa lacus ad margines flum. Lifune : Sept. 1858. No. 204.

9. **OE. tapeinosporum** Wittr. Prodr. Monogr. Oedog. 36 (1874).

Var. *angolense* W. et G. S. West in Journ. Bot. 1897, p. 5.

PUNGO ANDONGO.—Ad latera boreal. et occid. de Pedra Songue, c. *Scytomena Myochrous* var. *chorographicus* et *Dichotricha gypsophila* : April 1857. No. 12.

10. **OE. londinense** Wittr. l.c. 39 (1874). Forma oogoniis supra medium circumscissilibus, cellulis suffultiis saepe inflatis. W. et G. S. West. in Journ. Bot. 1897, p. 6.

PUNGO ANDONGO.—In pascuis spongiosis breviter graminosis juxta rupes gig. Praesidii pr. Catete, sparsis c. *Dichotricha gypsophila* ; May 1857. No. 111.

11. **OE. angustissimum** W. et G. S. West in Journ. Bot. 1897, p. 6.

HUILLA.—In uliginosis editoribus prope Humpata, Empalanca et Lopollo, plagas spongiosas unacum Eriocauloneis, Xyridibus et Utriculariis constituens ; May 1860. No. 15.

This species comes nearest to *OE. tenuissimum* Hansg. (in Notarisia, 1888, 398), but differs in being narrower, in having longer cells, binate oogonia, and smaller oospores which completely fill the latter.

12. **OEdogonium** sp. W. et G. S. West, l.c.

HUILLA.—Epiphyticum in *Zygguematis* sp. in paludibus exsiccatis ; April 1860. No. 176. This species may be a form of *OE. tenuissimum* Hansg. with longer cells, or of *OE. minutissimum* Grun. (in Rabenh. Fl. Europ. Algar. iii. 352).

13. **OEdogonii** sp. W. et G. S. West, l.c.

HUILLA.—In uliginosis editoribus prope Humpata, Empalanca, et Lopollo : May 1860. No. 15. Insufficient for accurate determination.

14. **OEdogonii** sp. W. et G. S. West, l.c.

MOSSAMEDES.—Freq. in stagnis puris ad ripas flum. Bero : Aug. 1859. No. 190.

15. **OEdogonii** sp. W. et G. S. West, l.c.

PUNGO ANDONGO.—Stirps amoenissime viridis, ad limum juxta rivulum Praesidii Casalalé crescens : Feb. 1857. No. 106. Ad ramulos Podostemacearum in rivulis Praesidii (Casalalé) ; Mar. 1857. No. 105.

## IV. ULVACEÆ.

## 1. ENTEROMORPHA Link (1820); em. J. Ag. (1883).

1. **E. Welwitschii** J. Ag. Till Algernes Systemet, vi, 143 (1883); W. et G. S. West in Journ. Bot. 1897, p. 6.

*Enteromorpha* sp. Welw. Phyc. Lusit. n. 289.

LOANDA.—Ad folia palmarum (*Cocos nucif.*) dintius in oceano agitata, prope Praia de Nazareth; Feb. 1854. No. 29.

The occurrence of this species is noteworthy, as Welwitsch had previously collected it in Portugal on *Scirpus maritimus*.

2. **E. tubulosa** Kütz. Tab. Phyc. vi, 32, t. 2; W. et G. S. West in Journ. Bot. 1897, p. 7.

LOANDA.—On a floating *Adansonia digitata* on the shore (Praia, of S. Jago), forming a green layer all over it; Nov. 1853. No. 31.

## V. ULOTRICHACEÆ.

## 1. HORMISCIA Fries (1835); em. Arech. (1866).

1. **H. subtilis** De Toni, Syll. Alg. 159, 160 (1889); W. et G. S. West in Journ. Bot. 1897, p. 33.

*Ulothrix subtilis* Kütz. Phyc. German. 197; Rabenh. Flor. Europ. Algar. iii. 365.

HUILLA.—Frequens in pascuis pluv. autunnalibus frequentius inundatis, denum exsiccatibus ad lacum magnum de Iwantala, inter *Porphyrosiphonem Notarissii*; March 1850. No. 18.

PUNGO ANDONGO.—In pascuis spongiosis breve graminosis juxta rupe gig. Praesidii pr. Catete; May 1857. No. 111.

Var. **variabilis** Kirchn. in Cohn, Kryptog.-Flora von Schles. 77 (1878); W. et G. S. West, *l.c.*

*Ulothrix variabilis* Kütz. Species Algar. 346; Rabenh., *l.c.*

PUNGO ANDONGO.—Freq. temp. pluv. in summis rupib. Praesidii; Feb. 1857. No. 6.

## 2. STIGEOCLONIUM Kütz (1843).

1. **Stigeoclonii?** sp. W. et G. S. West, *l.c.*

HUILLA.—Fragments amongst *Gonatomena tropicum*, etc., Morro de Lopollo; Feb. 1850. Nos. 172 and 186.

## 3. PSEPHOTAXUS W. et G. S. West in Journ. Bot. 1897, p. 33.

1. **P. lamellosus** W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Alga epiphytica in *Dichotricha gypsophila* (inter *Scytonema Myochroum* var. *chorographicum* et *Elogonium laevisporum* var. *angolense*) ad latera boreal. et occid. de Pedra Songue; April 1857. No. 12.

HUILLA.—In *Schizotricha natans* in graminosis paludosis juxta rivulum de Lopollo; April 1850. No. 180.

This is a most remarkable confervaceous alga, more especially on account of its short filaments of irregular cells with thick lamellose walls; the filaments are enclosed in an irregular mucous which seems to be formed from the outer lamelle of the cells. One method of

propagation is by the breaking up of the filaments into their component cells, each of which by division then forms a short irregular filament.

4. **CONFERVA** L. (1737); em. Lagerh. (1887).

1. **C. bombycina** Ag. Syst. Algar. 88; Wille in Ofv. K. Vet.-Akad. Förhandl. (1881), no. 8, 20-1.

*Forma minor* Wille, l.c., 21, t. i. fig. 36-40, t. ii. fig. 55, 56 (1881): W. et G. S. West in Journ. Bot. 1897, p. 34.

**PUNGO ANDONGO**.—Ad ramulos Podostemacearum in rivulis Praesidii (Casalalé); March 1857. No. 105.

2. **C. sandwicensis** Ag. Syst. Algar. 92 (1824); Nordst. Alg. et Char. Sandwic. 18, t. i. fig. 25; W. et G. S. West in Journ. Bot. 1897, p. 34.

**MOSSAMEDES**.—Freq. in stagnis puris ad ripas flum. Bero, inter *Edogonii* sp.; Aug. 1859. No. 190.

5. **MICROSPORA** Thur. (1850); em. Lagerh. (1887).

1. **M. amœna** Rabenh. Fl. Europ. Algar. iii. 321 (1868); W. et G. S. West in Journ. Bot. 1897, p. 34.

*Conferva amœna* Kütz. Species Algar. 372 (1849).

**GOLUNGO ALTO**.—Ad rupeis in flumine Luinha fluctuans; July 1856. No. 203.

2. **M. Wittrockii** Lagerh. in Bericht. Deutsch. Bot. Gesellsch. v. 417 (1887); W. et G. S. West in Journ. Bot. 1897, p. 34.

*Conferva Wittrockii* Wille in Ofv. K. Vet.-Akad. Förhandl. (1881), no. 8, 20, t. i. fig. 1-11.

**GOLUNGO ALTO**.—In stagnis parvis circa Fonte da Bança de Quilombo Quiacatubia, ast sparsim: Jan. 1855. No. 202.

3. **M. abbreviata** Lagerh., l.c., 417 (1888); W. et G. S. West in Journ. Bot. 1897, p. 34.

*Conferva abbreviata* Rabenh. Krypt. Flor. v. Sachs. 246 (1863); Flor. Europ. Algar. iii. 323.

**HUILLA**.—Alga lætissime viridis, lubrica, nebulosa, ad *Batrachospermum huillense* in rivulis prope Lopollo; May 1860. Nos. 187 and 4.

4. **M. Löfgrenii** Nordst. in Botaniska Notiser, 1882, 55; W. et G. S. West in Journ. Bot. 1897, p. 34.

*Conferva Löfgrenii* Nordst. in Wittr. & Nordst. Alg. aq. dulc. exsicce. No. 421 (1882).

**HUILLA**.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo, plagas spongiosas unacum *Eriocauloneis*, *Xyridibus* et *Utricularia* constituens; May 1860. No. 15. Etiam Morro de Lopollo; May 1860. No. 182.

Most of the plants had formed or were forming hypnospores, which when fully mature were globose or subglobose, with very thick lamellose walls; a few of these had evidently been formed from but part of the contents of a cell, and were externally nodulose. The cells had a very lamellose membrane, which character is most conspicuous during the formation of the hypnospores, the filaments

becoming at this period more or less irregular, and the cell-septa also growing very greatly in thickness by the addition of lamellæ on each side. The filaments do not appear to break up in the manner of other species of *Microspora* and *Confervæ*.

5. **M. fontinalis** De Toni, Syll. Alg. 230 (1899); W. et G. S. West in Journ. Bot. 1897, p. 34.

*Confervæ fontinalis* Berk, Glean. t. xiv, fig. 1. A variety agreeing with var. *ochracea* Zanard, in the relative length of its cells, but occurring in dark green masses.

LOANDA.—In aquis puris stagnantibus subsalsis urbis Loanda; June 1858. No. 198. Also drawn up from the bottom of the pit at Welwitsch's house in Loanda, a well which hardly receives the light of day through a narrow slit in the cover; April 1859. No. 145.

## VI. CHROOLEPIDACEÆ.

1. **TRENTEPOHLIA** Mart. (1817).

1. **T. lagenifera** Wille, in Pringsh. Jahrb. xviii. 427 (1887); W. et G. S. West in Journ. Bot. 1897, p. 35.

*Chroolepsis lageniformis* Hildebr. in Bot. Zeit. 85, t. iii. (1861).

GOLUNGO ALTO.—Inter *Scytoumna insignis* ad rupes rivul. Coango humect.; June 1856. No. 140.

2. **T. phyllophila** W. et G. S. West in Journ. Bot. 1897, p. 35.

GOLUNGO ALTO.—Ad folia plantæ acaulis monoecyl. (*Dicranum monostachya* Baker [confer Herb. Welw. No. 3747]) in Mata de Quisquela, prope Bango; July 1857. No. 148.

The green contents entirely fill the cells when living, but when dry they contract into a double-cone-shaped or dumb-bell-shaped mass in each cell. The branches rarely bear branchlets, except very short ones consisting of one or two cells. The species which most nearly approaches it is *T. tenuis* (Zell.) De Toni, from which it differs in its green colour, in its rather smaller size, in the equal thickness of its primary filaments and branches, and in its obovate zoogonidangia.

*Forma subnana*, fuscescens, cellulis paullo tumidis; crass. fil. 5-6  $\mu$ . (l.c.).

GOLUNGO ALTO.—Ad museorum snreculos (*Calyptothecium*) in rupibus juxta rivulos de Zengas do Queta; July 1856. No. 143.

## VII. CLADOPHIORACEÆ.

1. **RHIZOCOLONIUM** Kütz. (1843).

1. **R. crassipellitum** W. et G. S. West in Journ. Bot. 1897, p. 35.

LOANDA.—In terra humida umbrosa locis cultis; with cultivated plants in earthenware pots (em vasos de barra) at Museque Lopes in the island of Loanda, Aug. 1858. No. 205.

This species is characterised by its terrestrial habit, its very thick cell-walls, and the absence of rhizoids.

## 2. CLADOPHORA Kütz. (1843).

1. *C. crispata* (Roth) Kütz. *Phyc. Gener.* 264 (1843); Cooke, *Brit. Freshw. Alg.* 143, t. 55, fig. 3; W. et G. S. West in *Journ. Bot.* 1897, p. 36.

A form with the filaments not more than 1 to  $1\frac{1}{2}$  cm. high; branching subdichotomous, subsecund towards the apex; cells 6-12 times longer than broad.

LOANDA.—From the bottom of the well at Welwitsch's house in Loanda; Jan. 1859. No. 144.

2. *C. amplexens* Welw. ex W. et G. S. West in *Journ. Bot.* 1897, p. 36.

LOANDA.—Ad imam basin truncorum *Rhizophorarum* tempore refluxus oceanii aëri expositarum ad littora Loandensia frequens; Nov. 1853. No. 23.

This species belongs to the section *Egagropila*, and has rather a peculiar habit; Welwitsch likens the appearance of a tuft to that of a child's head.

3. *Cladophoræ* sp.

A minute fragment, insufficient for accurate determination; filaments about 1.5 mm. in length, branched repeatedly and irregularly; cells  $1\frac{1}{2}$  to 3 times as long as broad, mostly somewhat inflated, terminal cells acutely conical. Crass. cell. 33 to  $56 \mu$ . l.c.

PUNGO ANDONGO.—On Helices in Lagoa de Quibonda; Sept. 1857. No. 200.

## VIII. PITHOPHORACEÆ.

## 1. PITHOPHORA Wittr. (1877).

1. *P. radians* W. et G. S. West in *Journ. Bot.* 1897, p. 36.

LOANDA.—Copiose in aquariis aquae subdulcis insulae Cassanga prope Morro da Cruz; April 1854. No. 197. "Stirps vegetationis sua luxuria et vitæ fugacitate aequæ insignis."

The nearest species to this is *P. Edogoniam* (Mont.) Wittr., from which it differs in its much greater thickness, in having no branches of a third order, in never having binate spores, and in the intercalary spores being much less inflated.

## IX. TEMNOGAMETACEÆ

W. et G. S. West in *Journ. Bot.* 1897, p. 37.

## 1. TEMNOGAMETUM W. et G. S. West, l.c.

1. *T. heterosporum* W. et G. S. West, l.c.

HUILLA.—Forming dense intricate masses with *Gonatонема tropicum*, *Zygnuma spontaneum*, and *Stigeoclonium?* sp., Morro de Lopollo; Feb. 1860. No. 172.

This is a remarkable plant more particularly on account of its special conjugating cells; these are short, and cut off either singly or in pairs at intervals along the filaments. In the former case the conjugation is scalariform; these special cells in two contiguous

filaments put out short rounded conjugating tubes which unite the cells themselves becoming bent towards each other, and very soon the two cells coalesce and form the zygospore. In this way a zygospore is produced which at first sight very much resembles the central cell of the five cells constituting the spore of a *Mougeotia* of the section *Staurospermata*. In those filaments in which the pairs of cells are cut off the conjugation is lateral, the two cells forming a zygospore much resembling the aplanospore of a *Gionatomena*. In fact, these zygospores are oblique, and the convexities and concavities alternate along the filament precisely as in the case of a sporiferous filament of the latter genus.

Both scalariform and lateral conjugation occur in the same filaments. In all the specimens observed (which had been dry for a long period) the contents of the thick-walled spores appeared to have contracted into two approximate rounded masses; whether the latter had ever been perfectly united or had yet to unite within the wall of the spore is a matter that could not be definitely decided from the material.

On account of the peculiar conjugation, this plant has been placed as the type of a new order—*Temnogametaceæ*—of *Conjugata*.

## X. ZYGNEMACEÆ.

### 1. MOUGEOTIA Ag. (1824); em. Wittr. (1878).

1. **M.** (§ *Staurospermum*) *uberosperma* W. et G. S. West in Journ. Bot. 1897, p. 37.

HUILA.—In paludibus exsiccandis; April 1860. No. 176.

This characteristic species belongs to the section *Staurospermum*: in maturely conjugated specimens this can only be inferred from the genuflexed conjugating cells, but the young zygospores are subrectangular or subquadrate. The four processes present on the zygospores are developed very early, considerably before the zygospores are ripe, and are rarely of equal length: they are of the same diameter as the vegetative cells, and fit into them very closely.

2. **M.** (§ *Staurospermum*) *irregularis* W. et G. S. West in Journ. Bot. 1897, p. 38.

PUNGO ANDONGO.—In pascais spongiosis breviter graminosis juxta rupes gigant. Praesidii prope Catete: May 1857. No. 111.

The nearest species to this is *M. capucina* (Bory) Ag., from which it is distinguished by its size, its colour, and its curious zygospores.

3. **M.** (§ *Craterospermum*) *angolensis* W. et G. S. West in Journ. Bot. 1897, p. 38.

PUNGO ANDONGO.—Ad ramulos Podostemacearum (*Tristicha trifaria* Tul.) in rivulis Praesidii (Casalalé), inter *Edogonii Rothii* f. *majorem*: March 1857. No. 105.

This species differs from *M. latericrens* (A. Br.) Wittr. chiefly in the chromatophores each possessing a much fewer number of pyrenoids, and in the much smaller zygospores.

4. **Mougeotia** sp. W. et G. S. West, *l.c.*

HUILA.—Ad culmos *Elocharidis* fluitantis in rivulis de Morro de Lopollo (5300 ped. altit.): Feb. 1860. No. 188.

MOSSAMEDES.—Freq. in stagnis puris ad ripas flum. Bero: Aug. 1859. No. 190.

5. **Mougeotia** sp., *l.c.*

HUILLA.—Inter *Utriculariam cymbanthum*, Morro de Lopollo ; April 1860. No. 179.

Conjugation incomplete ; conjugating cells much bent.

2. **GONATONEMA** Wittr. (1878).1. **G. tropicum** W. et G. S. West in Journ. Bot. 1897, p. 38.

HUILLA.—Alga lète viridis, lubrica ad rupes submersas de Morro de Lopollo ; Feb. 1860. No. 186. Inter *Tennogametum heterosporum*, Morro de Lopollo ; Feb. 1860. No. 172. In paludibus exsiccandis ; April 1860. No. 176. Inter *Microsporom Löffgrenii*, Morro de Lopollo ; May 1860. No. 182.

This is a most characteristic species ; spores with processes of this nature are possessed only by two other algae in the order *Zygnemaceæ*, viz. *Mougeotia uberosperma* and *M. irregularis*. The consecutive spores, which are very large, are alternately oblique, the cells containing them being very slightly bent alternately to the right and left.

3. **PYXISPORA** W. et G. S. West in Journ. Bot. 1897, p. 39.1. **P. mirabilis** W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis ; April 1860. No. 176.

The fact that only a portion of the contents of the conjugating cells participates in the formation of the zygospore indicates a relationship to the fam. *Mesocarpaceæ*, although the arrangement of the chromatophores in the ordinary vegetative cells much resembles the arrangement in the genus *Zygnema* (fam. *Zygnemaceæ*). The character of the zygospores is, however, quite unique, and the plant has therefore been placed in a new family, *Pyxisporaceæ*.

4. **ZYGNEMA** Ag. (1824).1. **Z. ericetorum** Hansg. in Archiv. Naturw. Landesdurchf. von Böhmen, Bd. vi. 155–6 (1888) ; W. et G. S. West in Journ. Bot. 1897, p. 39.

*Zyggonium ericetorum* Kütz. Phyc. Gener. 280 (1843).

PUNGO ANDONGO.—Inter *Edogonii* sp. ad limum juxta rivulum de Casalalé ipsius Praesidii ; Feb. 1857. No. 106. Inter *Edogonii Rothii* f. *majorem* ad ramulos Podostemacearum in rivulis Praesidii (Casalalé) ; March 1857. No. 105. Ad Podostemaceas (*Tristicha trifolia* Tul.) in riv. de Cabondo ; Feb. 1857. No. 108.

HUILLA.—In udis sylvaticis et apricis inter Monino et lac. Ivantala ; April 1860. No. 14. In paludibus exsiccandis ; April 1860. No. 176.

2. **Z. spontaneum** Nordst. Alg. et Char. Sandvie. 17, t. i. f. 23–24 (1878) ; W. et G. S. West in Journ. Bot. 1897, p. 40.

HUILLA.—Inter *Gonatonema tropicum*, *Tennogametum heterosporum*, etc., Morro de Lopollo ; Feb. 1860. No. 172.

This most interesting species has very remarkable spores both with regard to their colour and markings. The original specimens from the Sandwich Islands described by Dr. Nordstedt had only aplanospores (hence the specific name) ; the African specimens have only zygospores. The relationship between the aplanospores and zygospores in this species is in all respects comparable to that between those of *Z. pachydermum* West : in the latter species the aplanospores are also smaller, globose, and possess a thinner membrane.

3. **Zygnematis** sp. W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Cum *Scytomeata* in Pedra Songue. April 1857. No. 153.

5. **SPIROGYRA** Link (1820).

1. **Spirogyræ** sp. W. et G. S. West in Journ. Bot. 1897, p. 40.

HUILLA.—Inter alias algas in uliginosis editoribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15. Not in sufficient quantity for absolute specific determination.

2. **Spirogyræ** sp. W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Inter *Batrachospermum nigrescens* in flum. Cuanza; March 1857. No. 104. Ad rupes humidas juxta flum. Cuanza; March 1857. No. 156.

GOLUNGO ALTO. Freq. in semistagnantibus ad ripas Rivi Quiapoze, Caminho (road) para Mussengue; Sept. 1855. No. 207.

3. **Spirogyræ** sp. W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Ad ramiculos Podostemacearum (Tristicha) in rivulis Presidii; March 1857. No. 109. Nothing can be made out of the specimens with any precision.

4. **S. neglecta** Kütz. Species Algar. 441 (1849); Rabenh. Fl. Europ. Algar. iii. 248; Petit, Spirog. de Paris, 26, t. ix, f. 1-5.

*Zygnema neglecta* Hass. Brit. Freshw. Alg. 142, t. 23, f. 1-2 (1845).

Var. *ternata* W. et G. S. West in Journ. Bot. 1897, p. 41.

*S. ternata* Ripart in Bull. Soc. Bot. Fr. xxiii. 162 (1876); Petit, *l.c.*, 26, t. viii, f. 4-7.

HUILLA.—Frequentissima post pluv. autumnal. ad margines rivulorum prope Lopollo; April 1860. No. 185.

5. **Spirogyræ** sp. W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Inter *Batrachospermum nigrescens* in riv. Cuanza; March 1857. No. 104.

6. **S. angolensis** Welw. ex W. et G. S. West in Journ. Bot. 1897, p. 41.

LOANDA.—Cum *Microspora fontinali* in aquis stagnorum puris (Cazimba) urbis Loanda; June 1858. No. 124. In stagnis artificialibus (Represa de Manuel Pereira van Huñen) circa Loandam; July 1854. Etiam No. 103.

The very dark-coloured conjugating filaments and the form of the zygospores characterise this species. *S. arctica* (Ag.) Kütz., to which No. 193 was referred by Welwitsch, is a much smaller plant with but one chromatophore, and the conjugating filaments are not dark-coloured.

7. **S. Welwitschii** W. et G. S. West in Journ. Bot. 1897, p. 41.

LOANDA.—Sp. denso agmine crescentis, nubecularum amoeniss. virid. ad instar aquis innatans; in stagnis artificialibus circa Loandam (Represa de M. Pereira van Huñen) c. *S. angolensi* Welw.; July 1854. No. 103.

This species approaches *S. derrimina* (Müll.) Kütz. (to which Welwitsch had referred it) and *S. neglecta* (Hass.) Kütz.; it differs from the former in its much greater thickness, shorter cells, and

larger zygospores : from the latter in its somewhat thicker filaments, shorter cells, the character of its chromatophores, and in its shorter zygospores.

The following may belong to this species :—

PUNGO ANDONGO.—Cellulae vegetativæ diametro (63–82  $\mu$ )  $1\frac{1}{4}$ – $2\frac{1}{2}$ –plo longioribus, extremitatibus non replicatis ; chromatophoris 3 (?), magnis cum marginibus serratis et pyrenoidibus magnis. In stagnis ad latera rivulorum (Casalalé) ; Feb. 1857. No. 206 (l.c., p. 42).

8. *Spirogyræ* sp., l.c.

LOANDA.—In Angolæ stagnis agri Loandensis, pr. Represa de M. Pereira ; Feb. 1854. No. 125.

9. *S. cylindrospora* W. et G. S. West in Journ. Bot. 1897, p. 42.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

The shortly cylindrical zygospores are very characteristic, fitting the cells like plugs pushed into them.

10. *Spirogyræ* sp., l.c.

GOLUNGO ALTO.—Freq. in semistagnantibus ad ripas rivi Quiapoze, Caminho (road) pr. Mussengue : Sept. 1855. No. 207.

## XI. DESMIDIACEÆ.

1. **GONATOZYGON** De Bary (1856).

1. **G. Ralpii** De Bary, Conj. 76–7, t. iv. f. 23–25 (1858) ; W. et G. S. West in Journ. Bot. 1897, p. 77.

PUNGO ANDONGO.—Inter *Batrachospermum gracillimum*, ad lapides submersas in rivulo de Tangue ips. Praesidii ; May 1857. No. 3.

2. **CYLINDROCYSTIS** Menegh. (1838).

1. **C. crassa** De Bary, l.c., 74, t. vii. C (1858) ; W. et G. S. West in Journ. Bot. 1897, p. 77.

PUNGO ANDONGO.—Ad latera boreal. et occid. de Pedra Songue : April 1857. No. 12.

3. **PENIUM** Bréb. (1846).

1. **P. oblongum** De Bary, l.c., 73, t. vii. G, f. 1, 2 (1858) ; W. et G. S. West in Journ. Bot. 1897, p. 77.

GOLUNGO ALTO.—Ad margines stagnorum rivi Cuango ; Aug. 1857. No. 155.

HUILLA.—In paludibus exsiccandis ; April 1860. No. 176. Morro de Lopollo ; Feb. 1860. No. 192.

2. **Penii** sp.

Long. 28  $\mu$  ; lat. 11.5  $\mu$  ; this is probably *P. Mooreanum* Arch., but not seen in sufficient quantity for accurate identification (l.c.).

HUILLA.—Inter *Utriculariam cymbantham*, Morro de Lopollo ; April 1860. No. 179.

3. **Penii** sp.

Long. 26  $\mu$  ; lat. 16  $\mu$  (l.c.).

HUILLA.—Prope lacum Ivantala ; March 1860. No. 17.

4. **P. curtum** Bréb. in Kütz. Species Algari, 167 (1849); W. et G. S. West in Journ. Bot. 1897, p. 77.

*Closterium curtum* Bréb. (1810); Kütz. (1845). *Cosmarium curtum* Ralfs, Brit. Desm. 109, t. xxxii, f. 9 (1848).

PUNGO ANDONGO.—In pascuis spongiosis breviter graminosis juxta rupes gigant. Praesidii pr. Catete : May 1857. No. 111.

HUILLA.—Morro de Lopollo : Feb. 1860. No. 192.

5. **P. adelochondrum** Elfv. in Acta Soc. Fauna et Flora Fenn. v. 2, no. 2, 17, t. i, f. 13 (1881); W. et G. S. West in Journ. Bot. 1897, p. 77.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo, plagas spongiosas unacum Eriocauloneis, Xyridibus et Utriculariis constitutis : May 1860. No. 15.

6. **P. variolatum** W. et G. S. West in Journ. Bot. 1897, p. 77, t. 368, f. 23.

HUILLA.—Inter *Utriculariam cyathantham*, Morro de Lopollo : April 1860. No. 179.

7. **P. minutum** Cleve in Ofv. K. Vet.-Akad. Förh. 1863, Arg. 20, no. 10, 493 (1864); W. et G. S. West in Journ. Bot. 1897, p. 78.

*Docidium minutum* Ralfs, Brit. Desm. 158, t. xxvi, f. 5 (1848). Cfr. *P. minutum* forma *genuina* West, in Journ. Linn. Soc. xxix, 129 (1892).

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo : May 1860. No. 15. In paludibus exsiccandis : April 1860. No. 176. Inter *Utriculariam cyathantham*, Morro de Lopollo : April 1860. No. 179. In graminosis paludosis juxta rivulum de Lopollo, April 1860. No. 180.

*Forma minor* Racib. in Pamiętnik Akad. Umiej. w Krakowie, Wydz. matem.-prz. x. (60-1), (1885); W. et G. S. West in Journ. Bot. 1897, p. 78.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo : May 1860. No. 15. In paludibus exsiccandis : April 1860. No. 176.

Var. *gracile* Wille in Vid.-Selsk. Forhandl. Christiania, No. 11, 51, t. ii, f. 33 (1880); W. et G. S. West in Journ. Bot. 1897, p. 78.

HUILLA.—In paludibus exsiccandis : April 1860. No. 176. Morro de Lopollo. No. 179.

Var. *crassum* West in Journ. Linn. Soc. xxix, (1892), p. 130, t. xx, f. 1; W. et G. S. West in Journ. Bot. 1897, p. 78.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo : May 1860. No. 15. Morro de Lopollo : May 1860. No. 182.

#### 4. CLOSTERIUM Nitzsch (1817).

1. **C. pusillum** Hantzsch in Rabenh. Alg. Eur. no. 1008 (1861); Rabenh. Fl. Europ. Alg. iii, 125 (1868).

Var. *subrectum* W. et G. S. West in Journ. Bot. 1897, p. 78, t. 368, f. 24.

PUNGO ANDONGO.—Inter *Scytomeria Myochroum* v. *chorographicum* et *Dichotrichum gypsophilum* ad latera boreal. et occid. de Pedra Songue : April 1857. No. 12.

2. **C. peracerosum** Gay, Essai Monogr. Conj. 75, t. ii. f. 18 (1883); Bull. Soc. Bot. Fr. xxxi. 339 (1884).

Var. **æthiopicum** W. et G. S. West in Journ. Bot. 1897, p. 78, t. 365, f. 9.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo); March 1857. No. 177.

3. **C. acerosum** Ehrenb. Abhandl. Akad. Wissenschaft. Berlin (1831), 68 (1832); Ralfs, Brit. Desm. 164, t. xxvii. f. 2.

*Vibrio acerosus* Schrank.

Var. **angolense** W. et G. S. West in Journ. Bot. 1897, p. 79.

GOLUNGO ALTO.—Ad margines stagnorum rivi Cuango: Aug. 1857. No. 155.

4. **C. turgidum** Ehrenb. Infus. 95, t. 6, f. 7 (1838); Ralfs, *l.c.*, 165, t. xxvii. f. 3 (1848); W. et G. S. West in Journ. Bot. 1897, p. 79.

A shorter form than the typical one.

MOSAMEDES.—In stagnis exsiccatis ad ripas flum. Bero: June 1859. No. 171.

5. **C. Leibleinii** Kütz. in Linnaea, viii. 596, t. xviii. f. 79 (1833); Ralfs, *l.c.*, 167-8, t. xxviii. f. 4 (1848); W. et G. S. West in Journ. Bot. 1897, p. 79.

Two forms:—

LOANDA.—In stagnis (Represa de Luiz Gomes); Feb. 1858. No. 136. Lat. 38  $\mu$ .

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo); March 1857. No. 177. Lat. 22  $\mu$ .

6. **C. regulare** Bréb. in Mém. Soc. Imp. Sciences, Cherbourg, iv. 148-9, 304, t. ii. f. 35 (1856).

*Forma minor* W. et G. S. West in Journ. Bot. 1897, p. 79.

HUILLA.—Cum *Nitella* sp. in stagnis pr. Catumba: April 1860. No. 189.

Some algologists appear to confuse this plant with *C. costatum* Corda; it is, however, very distinct from it.

##### 5. **DOCIDIUM** Bréb. (1844).

1. **D. trigeminiferum** W. et G. S. West in Journ. Bot. 1897, p. 79, t. 368, f. 32-34.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utricularium cymbantham*, Morro de Lopollo; April 1860. No. 179.

This species is readily distinguished from *D. baculum* Bréb. by the much slighter basal inflation with no constriction above it, and by the different basal granules.

##### 6. **PLEUROTÆNIUM** Næg. (1849).

1. **P. sparsipunctatum** W. et G. S. West in Journ. Bot. 1897, p. 79, t. 365, f. 10.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo); March 1857. No. 177.

This species can be compared with *P. subcoronulatum* (W. B. Turn.) West, and *P. conjunctum* (W. B. Turn.).

2. **P. Ehrenbergii** De Bary, Conj. 75 (1858).

*Docidium Ehrenbergii* Bréb. (1811); Ralfs, Brit. Desm. 157, t. xxvi, f. 4 (1848); W. et G. S. West in Journ. Bot. 1897, p. 80.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) : March 1857. No. 177.

3. **P. maximum** Lund, in Acta R. Soc. Scient. Ups. ser. 3, viii. no. ii. 89 (1871); W. et G. S. West in Journ. Bot. 1897, p. 80.

*Docidium maximum* Reinsch in Abhandl. Senckenb. Naturforsch. Gesellsch. vi. 140, t. xx, C. ii, f. 1-2 (1866-7); in Abhandl. Naturhist. Gesellsch. zu Nürnberg, iii. 181, t. xii, f. 1 (1866).

LIBONGO.—Ad margines flum. Lifune : Sept. 1858. No. 204.

The shorter semicells (which are sometimes only  $175\ \mu$  in length) have only one basal inflation : the longer ones have two.

7. **ICHTHYOCERCUS** W. et G. S. West in Journ. Bot. 1897, p. 80.1. **I. angolensis** W. et G. S. West, *l.c.*, t. 368, f. 26-31.

HUILLA.—In uliginosis editoribus prope Humpata, Empalanca et Lopollo, plaga spongiosa innaemis Eriocauloneis, Xyridibus et Utriculariis constitutus : May 1860. No. 15. In graminosis paludosis juxta rivulum de Lopollo : April 1860. No. 180. Morro de Lopollo : May 1860. No. 182.

This genus seems to be near *Tetmemorus* and *Euastrum*. It resembles the former in its elongate form, in being but slightly constricted in the middle, and in possessing a crenular (or very nearly crenular) vertical view : it differs from it, however, in the absence of the deep linear notch at the apex, in the presence of a spine at each apical angle, and in the general conformation of the upper half of the semicells, which are somewhat wedge-shaped, with convex surfaces. From *Euastrum* it differs in its very slight constriction, its more parallel sides in front view, and in its circular vertical view.

The cell membrane appears to be much less firm than that of a *Tetmemorus*. The punctulations on it are in some specimens dense and in others distant from each other, and occasionally they are so well developed at the apical angles as to give them a faintly rough appearance. In one example the spine at one of the apical angles was duplicated, the two spines being placed close together, and of different lengths.

It also approaches the genus *Triploceros*, but the delicate character of the membrane, which is also destitute of warts, and the somewhat different apex distinguish it.

8. **TETMEMORUS** Ralfs (1844).

1. **T. granulatus** Ralfs in Ann. Mag. Nat. Hist. xiv. 257, t. viii, f. 2 (1844); Brit. Desm. 147, t. xxiv, f. 2, C. xxxiii, f. 1 (1848); W. et G. S. West in Journ. Bot. 1897, p. 81.

*Clasterium granulatum* Bréb. (1839).

HUILLA. Inter Utriculariam cymbantham, Morro de Lopollo : April 1860. No. 179.

2. **T. laevis** Ralfs, Brit. Desm. 146, t. xxiv, f. 3 (1848).

*Clasterium laeve* Kütz. Phyc. Germ. 132 (1845).

Var **continuus** Nordst. Alg. Sandvie. 10 (1878); W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

3. **T. fissus** W. et G. S. West in Journ. Bot. 1897, p. 81, t. 368, f. 25.

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

This small species has somewhat unique characters that readily distinguish it from the other species of the genus.

9. **EUASTRUM** Ehrenb. (1832).

1. **E. aemon** W. et G. S. West in Journ. Bot. 1897, p. 81, t. 366, f. 11, 12.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo, plagas spongiosas inacum Eriocauloneis, Xyridibus et Utricularis constitutus: May 1860. No. 15.

The front view of this species is considerably different from that of *E. intermedium* Cleve, a depressed form of which it somewhat resembles at first sight, and the vertical and lateral views readily distinguish it from all *Euastria* of this class.

Var. **clausum** W. et G. S. West, *l.c.*, p. 82, t. 366, f. 13.

HUILLA.—In graminosis paludosis juxta rivulum de Lopollo; April 1860. No. 180.

2. **E. holoscherum** W. et G. S. West in Journ. Bot. 1897, p. 82, t. 366, f. 14.

HUILLA.—Inter *Microsporam abbreviatum* et *Batrachospermum huillense*, in rivulis prope Lopollo: May 1860. No. 187.

3. **E. ansatum** Ehrenb. Abhandl. Akad. Wissenschaft. Berlin (1831), 82 (1832); Infus. 162, t. xii. f. vi. 2 (1838); Ralfs, Brit. Desm. 85, t. xiv. f. 2; W. et G. S. West, *l.c.*

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo): March 1857. No. 177.

4. **E. huillense** W. et G. S. West in Journ. Bot. 1897, p. 82, t. 366, f. 15, 16.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15. Etiam in paludibus exsiccandis; April 1860. No. 176.

*E. ansatum* Ehrenb. var. *turgidum* Boerg. (in Vidensk. Medd. Naturh. Foren. Kjöben. (1890), 33, t. iii. f. 15) is somewhat near this species in outline, but its dimensions and other characters are very different.

5. **E. sinuosum** Lenorm. (1845); Ralfs, *l.c.*, 85, t. xiii. f. 5 *a, b, c* (1848).

Var. **reductum** W. et G. S. West in Journ. Bot. 1897, p. 83.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15. Morro de Lopollo; May 1860. No. 182.

6. **E. hypochondrum** Nordst. in Acta Univers. Lund. xvi. no. iv. 8, t. i. f. 11 (1880); W. et G. S. West, *l.c.* A form with slightly

different lateral lobes; this difference, however, may be owing to the specimens having been dried for a long period.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

7. **E. hypochoondroides** W. et G. S. West in Trans. Linn. Soc. 2 Ser. v. 49, t. vi, f. 8 (1895); in Journ. Bot. 1897, p. 83.

PUNGO ANDONGO.—In stagnis prope Ambilla (Congo); March 1857. No. 177.

8. **E. subpersonatum** W. et G. S. West in Journ. Bot. 1897, p. 83, t. 366, f. 19.

PUNGO ANDONGO.—In stagnis prope Ambilla (Congo); March 1857. No. 177.

This differs from *E. personatum* W. et G. S. West (in Trans. Linn. Soc. 2 Ser. v. 52-3, t. vi, f. 19) in having one median wart nearer the middle of the semicells and no accompanying serobiculations, in the lateral lobes being widest in their upper portion, and in the wide gaping apical notch.

9. **E. elegans** Kütz. Phyc. Germ. 135 (1845); Ralfs, *l.c.*, 89, t. xiv, f. 7; W. et G. S. West in Journ. Bot. 1897, p. 83.

*Heterocarpea elegans* Bréb. (1839).

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

PUNGO ANDONGO.—In stagnis prope Ambilla (Congo); March 1857. No. 177.

*E. incurvatum* W. B. Turn. (in K. Sv. Vet.-Akad. Handl. Bd. 25, No. 5, 83, t. xi, f. 1) and *E. annulatum* W. B. Turn. (*l.c.*, 80, t. x, f. 36, 52) seem to us to belong to *E. elegans*. Turner's drawing of the "lateral view" of *E. annulatum* (t. x, f. 52) shows that it is somewhat oblique, and not strictly a lateral view. The zygospore of *E. incurvatum* is also that of some forms of *E. elegans*.

10. **E. subinerme** W. et G. S. West in Journ. Bot. 1897, p. 84, t. 366, f. 18.

PUNGO ANDONGO.—In pascuis spongiosis breviter graminosis juxta rupes gng. Praesidi pr. Catete; May 1857. No. 111.

This species is in outline very similar to *E. inerme* (Ralfs) Lund. (Nova Acta R. Soc. Scient. Ups. ser. 3, viii, no. ii. (1871), 20, t. ii, f. 3), but it is much smaller and shorter, has different basal angles, and also a very different arrangement of surface tumors. From *E. sinuosum* Lenorm. it differs in its much smaller size and its short rectangular polar lobe as seen in front view; from the vertical view the polar lobe is oblong-elliptical, and not sinuate-quadrata.

11. **E. erosum** Lund., *l.c.*, 22, t. ii, f. 6 (1871).

*Forma minor* W. et G. S. West in Journ. Bot. 1897, p. 84.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

12. **E. cosmariooides** W. et G. S. West in Trans. Linn. Soc. 2 ser. v. 54, t. vi, f. 23 (1895).

Var. **curtum** W. et G. S. West in Journ. Bot. 1897, p. 84.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

13. **E. binale** Ehrenb. in Bericht. Verh. Preuss. Akad. Wissensch. Berlin, 208-9 (1840); Ralfs, Brit. Desm. 90, t. xiv. f. 8 (1848).

*Heterocarpella bivalvis* Turp. (1820), *Cosmarium Aitchisonii* as figured by W. B. Turner in K. Sv. Vet. Akad. Handl. Bd. xxv. no. 5 (1893), t. viii. f. 54 a, b (a is oblique); non *C. Aitchisonii* Schaarschm. (1884).

Var **angolense** W. et G. S. West in Journ. Bot. 1897, p. 84, t. 366, f. 8.

**HUILLA**.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

14. **E. denticulatum** Gay in Bull. Soc. Bot. France, xxxi. 335 (1884); W. et G. S. West in Journ. Bot. 1897, p. 84.

*E. binale* v. *denticulatum* Kirchn. in Cohn, Kryptog. Flora Schlesien. 159 (1878).

**PUNGO ANDONGO**.—In stagnis prope Anbilla (Condo); March 1857. No. 177.

**HUILLA**.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

*Forma*. A form with the lateral lobes partly subdivided; W. et G. S. West, l.c., p. 85 (cf. W. et G. S. West in Trans. Linn. Soc. 2nd ser. v. t. ix. f. 16).

**HUILLA**.—Inter *Gonatotrema tropicum*, Morro de Lopollo; Feb. 1860. No. 186.

15. **E. tetragonum** W. et G. S. West in Journ. Bot. 1897, p. 85, t. 366, f. 10.

**LIBONGO**.—Ad margines flum. Lifune; Sept. 1858. No. 204.

Compare with *E. denticulatum* v. *rectangulare* W. et G. S. West in Trans. Linn. Soc. 2nd ser. v. 53, t. vi. f. 21.

16. **E. bimorsum** W. et G. S. West in Journ. Bot. 1897, p. 85, t. 366, f. 17.

**HUILLA**.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo, plagas spongiosas unacum Eriocauloneis, Xyridibus et Utriculariis constituens; May 1860. No. 15.

This is very similar in outline to *E. Turnerii* West (in Journ. Linn. Soc. xxix. 141, t. xx. f. 18), but differs totally in both vertical and lateral views.

17. **E. subdivaricatum** W. et G. S. West in Journ. Bot. 1897, p. 85, t. 366, f. 9.

**HUILLA**.—In paludibus exsiccandis; April 1860. No. 176.

This approaches *E. divaricatum* Lund. (in Nova Acta R. Soc. Scient. Ups. ser. 3, viii. (1871), no. ii. 21, t. ii. f. 5), but differs from it in its broader apex with a very shallow notch, its trilobed median wart, in the two quadrigranulate warts within the apex, and in the trigranulate wart within each basal angle, which latter feature causes the vertical view to be rectangular-oblong.

10. **MICRASTERIAS** Ag. (1827).

1. **M. areuata** Bail. in Smithson. Contrib. ii. Art. 8, 37, t. i. f. 6 (1851); Nordst. in Ofvers. K. Vet.-Akad. Forh. no. 3 (1877), 22-23, ii. 1-2; W. et G. S. West in Journ. Bot. 1897, p. 86.

**HUILLA**.—In paludibus exsiccandis; April 1860. No. 176.

Var. **subpinnatifida** W. et G. S. West in Journ. Bot. 1897, p. 86, t. 366, f. 7.

HUILLA.—In paludibus exsiccandis : April 1860, No. 176. Inter *Utriculariam cyathantham*, Morro de Lopollo : April 1860, No. 179.

This variety appears to connect *M. arenata* with *M. pinnatifida*, its lobes are thicker and more horizontal than in typical examples of the former, and the basal ones much resemble those of the latter. The lobes, however, are not so thick and have not the same form as those of *M. pinnatifida*, the apex of the polar lobe is retuse in the middle, and the lobes all possess that small terminal sharp spine characteristic of all specimens of *M. arenata*.

2. **M. tropica** Nordst. in Vidensk. Medd. Naturh. Foren. Kjøben, 1869, no. 11, 15, 219, t. ii, f. 15 (1870).

*M. expansa* var.  $\gamma$  : Wallich in Ann. Mag. Nat. Hist. ser. 3, v. 276, 7, t. xiii, f. 9 (1860).

*Forma.*—Apical processes almost horizontal, also with two large granules, one on each side of the extremity of each sinus : W. et G. S. West in Journ. Bot. 1897, p. 86, t. 366, f. 1.

HUILLA.—In paludibus exsiccandis : April 1860, No. 176.

This form has the four larger granules (or papille) possessed by var. *guianense* Racib. [in Flora (1895), lxxxi, 34, t. iii, f. 15], but has not the teeth at their apex.

Var. **elegans** W. et G. S. West, *l.c.*, t. 366, f. 2.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condom) : March 1857, No. 177.

Var. **crassum** W. et G. S. West in Journ. Bot. 1897, p. 87, t. 366, f. 3.

HUILLA.—Inter *Utriculariam cyathantham*, Morro de Lopollo : April 1860, No. 179.

3. **M. robusta** W. et G. S. West in Journ. Bot. 1897, p. 87, t. 366, f. 5, 6.

HUILLA.—In paludibus exsiccandis : April 1860, No. 176.

This beautiful and characteristic species has a very robust appearance on account of the shortness and thickness of the lobes : the subuncinate form of the lateral lobes is also peculiar.

4. **M. polonica** W. et G. S. West in Journ. Bot. xxxiii, 66 (1895); xxxv, p. 87 (1897).

*M. Kitchellii* Wolle, *forma polonica* B. Eichl. & Gutw. in Rospr. Akadem. Umiejet. Krakow, Wydz. matem. prz., ser. ii, tom. viii, vol. xxviii, 173, t. v, f. 11 (1895).

HUILLA. In editis de Morro de Lopollo ; Feb. 1860, No. 192.

The African form has a higher polar lobe than the Polish one, and the infra-apical incision is a little more open. Eichler & Gutwinski's measurement given in the text, "long. cell. = 86  $\mu$ ," is evidently a mistake, as their figure measures but 39  $\mu$ .

5. **M. crenata** Bréb. in Röhrs. Brit. Desm. 75, t. vii, f. 2 and t. x, f. 4 (1848); W. et G. S. West in Journ. Bot. 1897, p. 87. This plant is proportionately longer than *M. truncata* Bréb. ; it has a more robust and deeper polar lobe, which is never retuse

in the middle, though often flattened; it is also a very much rarer species.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15. Etiam inter *Gonatoneura tropicum* et *Tennogaster heterosporum*, Morro de Lopollo; Feb. 1860. No. 172.

11. **XANTHIDIUM** Ehrenb. (1834).

1. **X. fasciculatum** Ehrenb. Infus. 147-8, t. x. f. 24b (1838); Ralfs, Brit. Desm. 114-5; W. et G. S. West in Journ. Bot. 1897, p. 88, t. 368, f. 16.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

2. **X. cristatum** Bréb. in Ralfs, Brit. Desm. 115, t. xix. f. 3 (1848).

Var. **tropicum** W. et G. S. West in Journ. Bot. 1897, p. 88, t. 368, f. 15.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

In this variety there are two more spines on each semi-cell than in typical specimens of *X. cristatum*, and the semi-cells are of a somewhat different form: it may perhaps be another species.

3. **X. subtrilobum** W. et G. S. West in Journ. Bot. 1897, p. 88, t. 368, f. 14.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo); March 1857. No. 177.

It differs from *X. trilobum* Nordst. [in Vidensk. Medd. Naturh. Foren. 1869, no. 14-15, 230-1, t. iii. f. 35 (1870)], in being more distinctly trilobed with a rectangular sinus between the terminal and lateral lobes, in the lobes being more rectangular, in the presence of a spine in the middle of the outer margin of each lateral lobe, in the absence of crenulation at the inferior angles of the latter, in the rectangular polar lobe having but one spine at each angle (as seen in vertical view), and in the narrower vertical view with a more prominent central protuberance.

This species is closely allied to *X. calcarato-aculeatum* (*Holocanthum calcarato-aculeatum* Hieronymus in Engler, Pflanzenwelt Ost-Afrika, Theil C, 20 (1895)), described from the opposite side of the African continent at about the same latitude.

12. **COSMARIUM** Corda (1834).

1. **C. centrotaphridium** W. et G. S. West in Journ. Bot. 1897, p. 113, t. 367, f. 3-6.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo, plagas spongiosas unacum *Eriocauloneis*, *Xyridibus* et *Utriculariis* constitutus; May 1860. No. 15.

The apex is subrectangular with a broad elevation at each angle, and another elevation in the centre, the latter not being as high as those at the angles. The four pairs of serobiculations are somewhat variable (cf. loc. cit. t. 367, f. 4-6); sometimes there are three in place of either or both of the two central pairs.

2. **C. sublobatum** Arch. in Pritch. Infus. 731 (1861).

*E. ?sublobatum* Bréb. in Ralfs, Brit. Desm. 91, t. xxxii. f. 4 (1848).

Var. *crispulum* De Toni, Syll. Alg. 1012; W. et G. S. West in Journ. Bot. 1897, p. 113.

*Euastrum sublobatum* Bréb. *C. crispulum* Nordst. in Acta Univ. Lund. ix, 10, t. i, f. 9 (1873). This variety is probably a *Euastrum*.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860 No. 179. In paludibus exsiccaudis; April 1860. No. 176.

3. **C. retusiforme** Gutz., in Bot. Centralbl. xlivi, 69 (1890); W. et G. S. West, *l.c.*

*C. Hammeri* Reinsch, var. *retusiforme* Wille in Vid. Selsk. Forhandl., Christiania, no. 11, 32, t. 1, f. 16 (1880).

HUILLA.—In paludibus exsiccaudis; April 1860. No. 176.

4. **C. retusum** Rabenh. Fl. Europ. Alg. iii, 167 (1868); W. et G. S. West, *l.c.*

*Euastrum retusum* Perty in Mittheil. Naturforsch. Gesellsch., Bern, 173 (1849); non Kütt. Phyc. Germ. 136 (1845).

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

5. **C. granatum** Bréb. in Ralfs, Brit. Desm. 96, t. xxxii, f. 6 (1848); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

We can now add West Central Africa to the distribution of this species, and this, along with its habitats in East Africa and Madagascar, still further confirms what Lagerheim has stated with regard to the cosmopolitan nature of the species.

6. **C. angustatum** Nordst. in Ofvers. K. Vet.-Akad. Förh. no. 6, 20 (1875); W. et G. S. West, *l.c.*, p. 114.

*Euastrum binale* var. *angustatum* Wittm. in Bih. t. K. Vet.-Akad. Handl. Bd. 1, no. 1, 50, t. iv, f. 8 (1872). *Euastrum polare* Nordst. in Ofv. K. Vet.-Akad. Förh. no. 6, 37, t. vii, f. 24 (1872). A form with the vertical view oblong.

HUILLA.—In uliginosis editioribus prope Huimpata, Empalanca et Lopollo; May 1860. No. 15.

7. **C. maximum** W. et G. S. West in Journ. Bot. 1897, p. 114.

*C. obsoletum* (Hantzsch) Reinsch, subsp. *maximum* Bürg. in Vidensk. Medd. Naturh. Foren. Kjöben., 1890, 42, t. iv, f. 37 (1891).

Var. *minor* W. et G. S. West in Journ. Bot. 1897, p. 114, t. 367, f. 21.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

*C. palustre* W. B. Turn. (in K. Sv. Vet.-Akad. Handl. Bd. xxv, No. 5, 60-1, t. viii, f. 65 and t. ix, f. 1) has some resemblance to this species, but is proportionately broader, has a much broader isthmus like that of *C. obsoletum*, and the spines at the basal angles are strongly convergent.

8. **C. Lundellii** Delp. in Memor. Accad. Sci. Torino, ser. 2, xxxi, 13, t. vii, f. 62-64 (1878).

*C. subcircularis* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. xxv, no. 5, 52, t. viii, f. 3 and t. ix, f. 27, 37 (1892).

Var. *aethiopicum* W. et G. S. West in *Journ. Bot.* 1897, p. 114.  
 LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

*Forma scrobiculata* W. et G. S. West, *l.c.*

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo); March 1857. No. 177.

9. **C. Baileyi** Wolle, *Desm. U. S.* 64, pl. xvi. f. 17, 18 (1884); W. et G. S. West, *l.c.*

*C. depressum* Bail., non (Näg.) Lund.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

Var. *angolense* W. et G. S. West in *Journ. Bot.* 1897, p. 114.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

Compare with *C. Baileyi* v. *major* W. et G. S. West (in *Trans. Linn. Soc.* 2nd ser. v. 246, t. xiv. f. 36).

10. **C. pyramidatum** Bréb. in Ralfs, *Brit. Desm.* 94, t. xv. f. 4 *a, b, c* (1848).

HUILLA.—In paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

*Forma tropica* W. et G. S. West in *Journ. Bot.* 1897, p. 115.

HUILLA.—Cum typ.: Nos. 176 and 179.

Var. *parallelum* W. et G. S. West, *l.c.*

HUILLA.—In editis de Morro de Lopollo; Feb. 1860. No. 192.

11. **C. pseudopyramidatum** Lund, in *Nova Acta R. Soc. Scient. Ups. ser. 3, vol. viii. no. ii. 41, t. ii. f. 18* (1871); W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

12. **C. ligoniforme** W. et G. S. West in *Journ. Bot.* 1897, p. 115, t. 367, f. 12.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15 (freq. c. zygosp.). Morro de Lopollo; April 1860. No. 182.

This species closely resembles some forms of *C. pseudopyramidatum* Lund, but is comparatively broader with wider apices, has different basal angles, and the zygospore is very different.

13. **C. variolatum** Lund., *l.c.*, 41, t. ii. f. 19 (1871); W. et G. S. West in *Journ. Bot.* 1897, p. 115.

(a.) *Forma scrobiculata numerosioribus.*

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

GOLUNGO ALTO.—Inter *Scytonema Arcangelii* ad muscos prope fontem magn. ad Bança do Sobato de Bango; Sept. 1855. No. 159.

(b.) *Forma semicellulis latioribus.*

HUILLA.—Morro de Lopollo; Feb. 1860. No. 192.

14. **C. africanum** W. et G. S. West in *Journ. Bot.* 1897, p. 115, t. 368, f. 1.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176. Morro de Lopollo; Feb. 1860. No. 192.

This is somewhat like *C. nitidulum* De Not. in form, but the very thick and serobiculate membrane easily distinguishes it.

15. **C. trifossum** W. et G. S. West in Journ. Bot. 1897, p. 116, t. 367, f. 19.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860, No. 179. In paludibus exsiccandis; April 1860, No. 176. Etiam in graminosis paludosis juxta rivulum de Lopollo; April 1860, No. 180.

The three shallow notches seen in the front view of each semi-cell are due to the presence of three grooves running at right angles to both the longitudinal and transverse axes.

16. **C. galeritum** Nordst. in Vidensk. Medd. Naturh. Foren. Kjöben, 1869, No. 11-15, 209-210, t. iii, f. 26 (1870); W. et G. S. West in Journ. Bot. 1897, p. 116.

LIBONGO.—Ad margines thum. Lifune; Sept. 1858. No. 204.

17. **C. nitidulum** Not. Desm. Ital. 42, t. iii, f. 26 (1867).

*C. rectosporum* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 69, t. x, f. 16 (1893).

Var. *minor* W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

18. **C. scenedesmus** Delp. in Memor. Accad. Sci. Torino, ser. 2, xxx. 5-6, t. vii, f. 28-31 (1878).

Var. *dorsitruncatum* Nordst. in K. Sv. Vet.-Akad. Handl. Bd. xxii, no. 8, 59, t. iii, f. 15 (1888); W. et G. S. West, *l.c.*

A small form with a perfectly smooth membrane.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

LIBONGO.—Ad margines thum. Lifune; Sept. 1858. No. 204.

19. **C. æthiopicum** W. et G. S. West in Journ. Bot. 1897, p. 116, t. 367, f. 20.

PUNGO ANDONIO.—Inter *Seytonema Myochrous* v. *chorographicum* et *Dichotrichum gypsophilum* ad latera boreal. et occid. de Pedra Songue; April 1857. No. 12.

HUILLA.—Inter *Porphyrosiphonum Notarisi* prope lacum Ivantala; March 1860. No. 17.

In outline this species calls to mind *C. rectangularis* Grun. 1868 (= *C. Gotlandicum* Wittr. 1872), but the more angular semi-cells, the much broader isthmus, and the plications present on the upper half of the semi-cells, at once distinguish it.

20. **C. pseudoprotuberans** Kirchn. in Cohn, Kryptog. Flora von Schlesien, Zweit. Bd. 150 (1878); Nordst. in Ofv. K. Vet.-Akad. Forh. no. 3, 8, t. vii, f. 3 (1885); W. et G. S. West, *l.c.*, p. 117.

A small form agreeing with var. *pygmaeum* Gutw. (Flora glonów okolie Lwowa, 54, t. ii, f. 9) in dimensions, but of the same form as the type.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

21. **C. polygonum** Arch. in Pritch. Infus. 732 (1861).

*Euastrum polygonum* Nag. Gatt. Einz. Alg. 120, t. 7A, f. 9 (1849).

Var. *exile* W. et G. S. West in Journ. Bot. 1897, p. 117.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

Compare with *C. polygonum* v. *minus* Hieronymus.

22. *C. ellipsoideum* Elfv. in Acta Soc. Fauna et Flora Fenn. ii. no. 2, 13, t. i f. 10 (1881).

Var. *minor* Racib. in Pamietnik Akad. Umiej. w Krakowie, Wydz. Matem.-prz. x. (84), t. x. f. 9 (1885) ; W. et G. S. West, *l.c.*

*C. proteiforme* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. xxv. no. 5, 64, t. ix. f. 26 (1892).

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

23. *C. submamilliferum* W. et G. S. West in Journ. Bot. 1897, p. 117, t. 368, f. 8.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

This is distinguished from *C. mamilliferum* Nordst. in Vidensk. Medd. Naturh. Foren. Kjöben. 1869, no. 14-15, 212, t. iii, f. 22 (1870) by the very different form of the semi-cells in front view.

24. *C. meteoronotum* W. et G. S. West in Journ. Bot. 1897, p. 117, t. 367, f. 18.

HUILLA.—In uliginois editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

This differs from *C. sexangulare* Lund. (in Nova Acta R. Soc. Scient. Ups. ser. 3, vol. 8, no. ii. 35, t. ii. f. 23) in its larger size, its relatively greater length, and in its unequal hexagonal semi-cells.

25. *C. sulcatum* Nordst. Alg. Sandvie. 13, t. i. f. 18 (1878) ; W. et G. S. West, *l.c.*, p. 118.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

26. *C. heterochondrum* Nordst. in Acta Univers. Lund. xvi. p. 5, t. i. f. 3 (1880).

Var. *mediogemmatum* W. et G. S. West in Journ. Bot. 1900, p. 292.

*C. mediogemmatum* W. et G. S. West in *op. cit.* 1897, p. 118, t. 367, f. 11.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

The lateral angles of this plant are usually finely granulate.

27. *C. sinostegos* Schaarssch. in Magyar. Tudom. Akad. Math. Természett. Közlemén. xviii. 266, tab. i. f. 12 (1883).

Var. *obtusius* Gutw. in Sprawozd. Komisyi fizyographic., Akad. Umiej. w. Krakowie, xxviii. pt. ii. 129, t. ii. f. 13 (1893) ; W. et G. S. West in Trans. Linn. Soc. ser. 2, v. 58, t. vi. f. 33 (1895) ; Journ. Bot. 1897, p. 118.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

28. *C. emarginatum* W. et G. S. West in Trans. Linn. Soc. ser. 2, v. 58, t. viii. f. 14 (1895) ; Journ. Bot. 1897, p. 118.

A large form with a narrower isthmus.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

29. *C. minimum* W. et G. S. West in Trans. Linn. Soc. 58, t. viii, f. 10 (1895); Journ. Bot. 1897, p. 118.

HUILLA.—In paludibus exsiccandis : April 1860. No. 176. In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15. Morro de Lopollo : May 1860. No. 182.

30. *C. exiguum* Arch. in Proe. Dubl. Nat. Hist. Soc. vol. iv, pt. i. 49-50, t. i. f. 32-33 (1861); Nordst. in K. Sv. Vet. Akad. Handl. Bd. 22, no. 8, 58, t. vi, f. 12 (1888); W. et G. S. West in Journ. Bot. 1897, p. 118.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

31. *C. norimbergense* Reinsch in Abhandl. Naturhistor. Gesellsch. Nürnberg, Bd. 3, 113, t. ix, f. 2 (1866).

*C. Hammeri* Reinsch, var. *octogibbosum* Reinsch, *l.c.*, 112, t. x, f. 1. *C. octogibbosum* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, 52 (1892). *C. octogibbosum* var. *indica* W. B. Turn., *l.c.*, t. viii, f. 8.

*Forma elongata* W. et G. S. West in Journ. Bot. 1827, p. 119. *C. exiguum* Arch. var. *norimbergense* Schmidle in Flora, lxxviii, 56, t. vii, f. 17 (1894).

HUILLA.—In paludibus exsiccandis : April 1860. No. 176. Inter *Utriculariam*, Morro de Lopollo : April 1860. No. 179. In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

*Forma deppressa* W. et G. S. West, *l.c.*

LOANDA.—In stagnis (Represa de Luiz Gomes) : Feb. 1858. No. 136.

32. *C. Meneghinii* Bréb. in Ralfs, Brit. Desm. 96, t. xv, f. 6 (1848); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune : Sept. 1858. No. 204.

Small forms, but otherwise exactly agreeing with the figures in Ralfs (*l.c.*).

Var. *angulosum* Rabenh. Fl. Europ. Alg. iii. 163 (1868); W. et G. S. West, *l.c.*

*C. angulosum* Bréb. in Mém. Sciences Nat. Cherbourg, iv. 127, 303, t. i. f. 17 (1856).

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

PUNGO ANDONGO.—Ad ramiculos Podostemacearum in rivulis Praesidi (Casalalé) : March 1857. No. 105.

Var. *simplicimum* Wille in Vid.-Selsk. Forhandl. Christiania, no. 11, 30, t. i. f. 11 (1880); W. et G. S. West *l.c.*

LIBONGO.—Ad margines flum. Lifune : Sept. 1858. No. 204.

PUNGO ANDONGO.—Ad ramiculos Podostemacearum in rivulis Praesidi (Casalale) : March 1857. No. 105.

33. *C. laeve* Rabenh. Fl. Europ. Alg. iii. 161 (1868); Nordst. in Ofv. K. Vet.-Akad. Förh. no. 6, 29, t. xii, f. 4 (1876).

Var. **minimum** W. et G. S. West in *Journ. Bot.* 1897, p. 119, t. 368, f. 6.

**HUILLA.**—In uliginosis editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

34. **C. subpyriforme** Lagerh. in *Botan. Notiser.* 1887, 197, c. fig. ; W. et G. S. West in *Journ. Bot.* 1897, p. 119. A very small form with rather broader bases to the semi-cells than the type ; other views not obtainable.

**HUILLA.**—Inter *Utriculariam*, Morro de Lopollo ; April 1860. No. 179.

35. **C. affine** Racib. in *Rosprawy Akad. Umiej. Krakow.* Wydzial. Mat.-przyr. ser. 2, t. ii. (vol. xxii.) 363, t. vi. f. 25 (1892).

Var. **africanum** W. et G. S. West in *Journ. Bot.* 1897, p. 120, t. 368, f. 7.

**LIBONGO.**—Ad margines flum. Lifune ; Sept. 1858. No. 204.

36. **C. minutissimum** Arch. in *Q. J. M. S.* xvii. (new ser.) 194 et 301 (1877) ; Cooke, *Brit. Desm.* 91 ; W. et G. S. West in *Journ. Bot.* 1897, p. 120.

**HUILLA.**—Morro de Lopollo : May 1860. No. 182.

37. **C. galeatum** W. et G. S. West in *Journ. Bot.* 1897, p. 120, t. 368, f. 2. 3.

**HUILLA.**—Morro de Lopollo ; Feb. 1860. No. 192.

The form of this species together with its small size and the presence of a tooth at each basal angle easily distinguish it.

38. **C. libongense** W. et G. S. West in *Journ. Bot.* 1897, p. 120, t. 368, f. 12.

**LIBONGO.**—Ad margines flum. Lifune ; Sept. 1858. No. 204.

This differs from *C. subundulatum* Wille in its shorter cells, its truncate apices, its crenate lateral margins, its entire absence of granules, and in its different vertical and lateral views. From *C. subundulatum* var. *Beaudanii* West it differs in its crenate lateral margin, its more truncate apices, in the absence of granules, and in its different vertical view.

39. **C. repandum** Nordst. in *Botan. Notiser.* 1887, 162 ; in *K. Sv. Vet.-Akad. Handl. Bd.* 22, no. 8, 58, t. vi. f. 14 (1888) ; W. et G. S. West in *Journ. Bot.* 1897, p. 120, t. 368, f. 13. A form with the semi-cells a little dilated upwards.

**HUILLA.**—In uliginosis editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

*C. odontopleurum* Arch. (in Roy et Biss. in *Ann. Scott. Nat. Hist.* (1894), 169, t. ii. f. 13) appears to be only a small form of *C. repandum* Nordst.

40. **C. multiordinatum** W. et G. S. West in *Journ. Bot.* 1897, p. 121, t. 367, f. 8.

**PUNGO ANDONGO.**—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

This is nearest to *C. decoratum* W. et G. S. West (in *Trans. Linn.*

Soc. 2nd ser. v. 61, t. vii, f. 21), but it is easily distinguished by its shorter cells, its smaller size, its round (not triangular) scrobiculations surrounding the granules, as well as its wider apex.

This is the only species we know which has the two opposite sides of the hexagons of scrobiculations surrounding each granule, horizontally disposed.

41. *C. margaritatum* Roy & Biss. in Journ. Bot. xxiv. 191 (1886); Roy in Ann. Scott. Nat. Hist. 167, t. ii, f. 12 (1891).

*C. latum* Bréb. var. *margaritatum* Lund. in Nova Acta R. Soc. Scient. Ups. ser. 3, viii, 26 (1871).

*Forma minor* Boldt, in Bih. till Sv. Vet.-Akad. Handl. Bd. 13, Afsl. 3, no. 5, 26 (1888); W. et G. S. West in Journ. Bot. 1897, p. 121.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

42. *C. Portianum* Arch. in Q. J. M. S. viii, 235-6, t. xi, f. 8, 9 (1860); in Pritsch. Infus. 733 (1861); Rabenh. Fl. Europ. Alg. iii. 160 (1868).

Var. *orthostichum* Schmidle in Bericht. Deutsch. Bot. Ges. Bd. xi. Heft. 10, 519, t. xxviii, f. 7 (1893). *Forma minor* W. et G. S. West in Journ. Bot. 1897, p. 121, t. 368, 4, 9.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

This approaches *C. nephroidium* Roy & Biss. in Ann. Scott. Nat. Hist. 1894, 169, t. ii, f. 3), which seems to differ from *C. Portianum* var. *nephroidium* Wittr. both in its smaller size and in the regular arrangement of its granules.

43. *C. trachycyrtum* Reinsch, Contrib. Alg. et Fung. 83, t. xviii, f. 1 (1875); W. et G. S. West in Journ. Bot. 1897, p. 121.

HUILLA.—Inter *Porphyrosiphonem Notarisi* Kütz. in udis sylvaticis et apriis inter Monino et lac. Ivantala; April 1860. No. 14.

44. *C. punctulatum* Bréb. in Mém. Soc. Sciences Nat. Cherbourg, iv. 129, 303, t. i, f. 16 (1856); Klebs in Schrift. phys.-ökonom. Gesellsch. Königsberg, xx. 37, t. iii, f. 50, 51 (1879); W. et G. S. West *l.c.*

HUILLA.—In rivulis prope Lopollo; May 1860. No. 187.

Var. *elongatum* Klebs, *l.c.*, t. iii, f. 53; W. et G. S. West in Journ. Bot. 1897, p. 122.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo; May 1860. No. 15.

45. *C. concentricum* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 62, t. ix, f. 11 (1893).

Var. *radiatum* W. et G. S. West in Journ. Bot. 1897, p. 122, t. 368, f. 10.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanea et Lopollo; May 1860. No. 15.

46. *C. Blyttii* Wille in Vid.-Selsk. Forhandl. Christiania, no. 11, 25, t. i, f. 7 (1880); W. et G. S. West in Journ. Bot. 1897, p. 122.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

47. **C. subcostatum** Nordst. in Ofv. K. Vet.-Akad. Forh. no. 6, 37-8, t. xii. f. 13 (1876).

*Forma minor* W. et G. S. West in Journ. Bot. xxxiv. 379, t. 361, f. 15 (1896); xxxv. 122 (1897).

MOSSAMEDES.—Inter Charas in rivo Caroca pr. Cabo negro ; Sept. 1859. No. 19.

48. **C. alatum** Kirchn. in Cohn, Kryptogamen-flora von Schlesien, Zweit. Bd., 153 (1878); W. et G. S. West in Journ. Bot. 1897, p. 122.

LOANDA.—In stagnis (Represa de Luiz Gomes) ; Feb. 1858. No. 136.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

Var. **suboblongum** W. et G. S. West in Journ. Bot. 1897, p. 122.

PUNGO ANDONGO.—Ad ramulos Podostemacearum in rivulis Praesidii (Casalalé) ; March 1857. No. 105.

49. **C. subtordinatum** W. et G. S. West in Journ. Bot. 1897, p. 122, t. 368, f. 11.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

The nearest species to this is *C. triordinatum* W. et G. S. West (in Trans. Linn. Soc. ser. 2, v. 66, t. vii. f. 27), from which it differs in its less wide cells, its rounded and not acute granules, its smooth apex, and in its quadrate (not rounded) and fewer central warts.

50. **C. callistum** W. et G. S. West in Journ. Bot. 1897, p. 172, t. 367, f. 13.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

51. **C. colonophorum** W. et G. S. West in Journ. Bot. 1897, p. 172, t. 367, f. 1.

HUILLA.—In paludibus exsiccandis ; April 1860. No. 176.

This is a noteworthy species, the large size of the warts and their arrangement easily distinguishing it from any other : the four median warts on each side of the vertical view being especially pronounced.

52. **C. bilunatum** W. et G. S. West in Journ. Bot. 1897, p. 173, t. 367, f. 17.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

This characteristic species is nearest in outline to *C. procelsum* W. B. Turn. and *C. indicum* W. B. Turn.

53. **C. mucronatum** W. et G. S. West in Journ. Bot. 1897, p. 173, t. 367, f. 16.

HUILLA.—In paludibus exsiccandis ; April 1860. No. 176. Inter *Utriculariam*, Morro de Lopollo ; April 1860. No. 179.

This species is distinguished from *C. pseudotaxichondrum* Nordst. by its rounded semi-cells, by the complete absence of granules, and by the oblong vertical view.

54. **C. pseudotaxichondrum** Nordst in Ofvers K. Vet.-Akad. Förh. no. 3, 20, t. ii. f. 5 (1877).

Var. **africanum** W. et G. S. West in Journ. Bot. 1897, p. 175, t. 367, f. 14.

HUILLA. In paludibus exsiccandis : April 1860. No. 176. Inter *Utriculariam*, Morro de Lopollo : April 1860. No. 179.

55. **C. huillense** W. et G. S. West in Journ. Bot. 1897, p. 174, t. 367, f. 15.

HUILLA.—In paludibus exsiccandis : April 1860. No. 176.

This differs from *C. toxicandrum* Lund, in having three groups of granules on each semi-cell, one across the front of each side of the semi-cell and one at the apex, in the more numerous and smaller granules, and in the presence of minute serobiculations round these granules.

56. **C. angolense** W. et G. S. West in Journ. Bot. 1897, p. 174, t. 367, f. 7.

HUILLA.—In paludibus exsiccandis : April 1860. No. 176.

The two series of spines in vertical view are concave towards each other.

57. **C. tetrastichum** W. et G. S. West in Journ. Bot. 1897, p. 174, t. 367, f. 9.

HUILLA. Inter *Utriculariam*, Morro de Lopollo : April 1860. No. 179. Morro de Lopollo : Feb. 1860. No. 192.

Var. **depauperatum** W. et G. S. West, *l.c.*, t. 367, f. 10.

HUILLA.—In paludibus exsiccandis : April 1860. No. 176.

58. **C. subspeciosum** Nordst. in Ofv. af K. Vet.-Akad. Förh. no. 6, 22, t. vi, f. 13 (1875); W. et G. S. West, *l.c.*, p. 175.

A form which is most probably var. *validissimum* Nordst., but specimens not in a condition for the satisfactory determination of this point.

PUNGO ANDONGO.—In rivulis Praesidii (Casalalé) : March 1857. No. 105.

59. **C. Welwitschii** W. et G. S. West in Journ. Bot. 1897, p. 175, t. 367, f. 2.

HUILLA. In paludibus exsiccandis : April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo : April 1860. No. 179.

This handsome species approaches *C. Lagerheimianum* W. et G. S. West, *l.c.* [*Dysphinctium Lagerheimianum* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5 (1893), 43, t. xxii, f. 6], but differs greatly in its much deeper constriction, in its flattened apices, in the double series of emarginate warts, in the shorter conical warts (not elongated papillæ), and in the very densely serobiculate membrane. In the vertical view the double series of emarginate warts are concave towards each other in the centre, and subparallel towards the poles.

60. **C. æquinoctiale** W. et G. S. West in Journ. Bot. 1897, p. 175, t. 365, f. 11.

LIBONGO. Ad margines flum. Lifune : Sept. 1858. No. 204.

This is distinguished from *C. orbicularis* Ralfs in its less orbicular semi-cells, its much broader isthmus, and in its smaller granules with definite arrangement. Compare also with *C. quinque* W. et G. S. West, *l.c.* [*Dysphinctium quinque* W. B. Turn.].

61. **C. contractum** Kirchn. in Cohn, Kryptogamen-flora von Schles. Zweit. Bd. 147 (1878); Wolle, Desm. U. S. 63, t. 16, f. 1; t. 50, f. 24 (1884); W. et G. L. West, *l.c.*

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) : March 1857. No. 177.

62. **C. Oocystidum** W. et G. S. West in Journ. Bot. 1897, p. 175, t. 366, f. 21.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

63. **C. Cucurbita** Bréb. in Desmaz. Pl. Cryptog. Fr. fasc. xxiii. 1103 (1841), in ed. i. ser. i. (1825-51); Ralfs, Brit. Desm. 108-9, t. xvii. f. 7 (1848); W. et G. S. West in Journ. Bot. 1897, p. 176.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176. Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179. Morro de Lopollo; Feb. 1860. No. 192.

All the African examples are more densely and minutely punctate than the typical plant.

*Forma minor* W. et G. S. West, *l.c.*

HUILLA.—Cum forma typ. Nos. 176 and 179.

Var. **minimum** W. et G. S. West, *l.c.*

HUILLA.—Cum forma typ. No. 179.

64. **C. palangula** Bréb. in Ralfs, Brit. Desm. 212 (1848); W. et G. S. West, *l.c.*

HUILLA.—In uliginosis editoribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

### 13. STAURASTRUM Meyen (1829).

1. **S. leptodermum** Lund. in Nova Acta R. Soc. Scient. Ups. ser. 3, viii, no. ii. 58, t. iii. f. 26 (1871).

*Forma minor* W. et G. S. West, in Journ. Bot. 1897, p. 176.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

2. **S. tripodium** W. et G. S. West in Journ. Bot. 1897, p. 176, t. 369, f. 11.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

This species and *S. xiphidiophorum* Wolle are respectively simple and complex species of a distinct section of this genus.

3. **S. crux-alternans** W. et G. S. West in Journ. Bot. 1897, p. 176, t. 369, f. 14.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

This at first sight reminds one of *S. inconspicuum* Nordst.; but it differs in its much more robust processes, which are directed horizontally, and have not the nodulose swelling on the under side.

4. **S. huillense** W. et G. S. West in Journ. Bot. 1897, p. 177, t. 368, f. 17.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

5. **S. egregium** W. et G. S. West in Journ. Bot. 1897, p. 177, t. 369, f. 12.

HUILLA.—In uliginosis editioribus prope Humpata, Empalmea et Lopollo; May 1860. No. 15. Etiam Morro de Lopollo; May 1860. No. 182.

This *Staurastrum* belongs to the same section as *S. quadricornutum* Roy & Biss. and *S. gemelliparum* Nordst., but is very distinct from either. Each of the three angles of the semi-cells is more or less quadrate with a short bifurcate process at the two upper corners, with an emarginate wart at each of the lower corners, and a short stout spine between the two emarginate warts.

6. **S. tridens-Neptuni** W. et G. S. West in Journ. Bot. 1897, p. 177, t. 369, f. 7.

HUILLA.—Freq. in paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

The nearest species to this is *S. subtrifurcatum* W. et G. S. West [in Trans. Linn. Soc. 2nd ser. v. 258 9, t. xvi. f. 24 (1826)], from which it is distinguished by the three diverging and somewhat shorter spines at each angle being situated in a vertical plane, and in the pentagonal vertical view with acute angles.

7. **S. pentateuchophorum** W. et G. S. West in Journ. Bot. 1897, p. 178, t. 369, f. 6.

HUILLA.—Freq. in paludibus exsiccandis; April 1860. No. 176. Etiam freq. inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

This species is somewhat allied to *S. tridens-Neptuni*, but is very distinct from it.

8. **S. heteroplophorum** W. et G. S. West in Journ. Bot. 1897, p. 178, t. 369, f. 8.

HUILLA.—Freq. in paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

The arrangement of the spines on the much narrower angles (as seen in vertical view) easily distinguishes this species from *S. Hystrix* Ralfs. At each angle there are two large spines in a vertical plane, and about six much smaller ones round them; the latter are sometimes regularly disposed in a circle round the two larger ones.

Var. *latum* W. et G. S. West in Journ. Bot. 1897, p. 178, t. 369, f. 9.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

9. **S. Pseudohystrix** W. et G. S. West in Journ. Bot. 1897, p. 178, t. 369, f. 10.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

This species differs from *S. Hystrix* Ralfs in its smaller size, its more angular semicells, its fewer, longer, thinner, and curved spines which are confined to the face of the truncate angles.

10. **S. Welwitschii** W. et G. S. West in Journ. Bot. 1897, p. 179, t. 369, f. 1.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

This is a very characteristic species.

11. **S. Corbula** W. et G. S. West in Journ. Bot. 1897, p. 179, t. 369, f. 2.

**HUILLA.**—In paludibus exsiccandis ; April 1860. No. 176.

This species has about twenty-five very short spines on each of the three angles of a semi-cell, over which is placed a pair of slender, erect and longer spines. It most nearly approaches *S. Welwitschii* in form and arrangement of spines, but differs from it in being triangular in vertical view, and in having a pair of slender erect spines in place of the single stout spine of the latter species. The angles are also furnished with more numerous and shorter spines, and it is moreover a smaller, much more constricted species.

Var. **pulchrum** W. et G. S. West in Journ. Bot. 1897, p. 179, t. 369, f. 3.

**HUILLA.**—In editis de Morro de Lopollo ; Feb. 1860. No. 192.

12. **S. actinotum** W. et G. S. West in Journ. Bot. 1897, p. 180, t. 369, f. 4.

**HUILLA.**—In paludibus exsiccandis ; April 1860. No. 176.

This peculiar *Staurastrum* does not appear to be closely related to any other.

Var. **simplex** W. et G. S. West, *l.c.*, t. 369, f. 5.

**HUILLA.**—Inter *Utriculariam*, Morro de Lopollo ; April 1860. No. 179.

13. **S. cassidum** W. et G. S. West in Journ. Bot. 1897, p. 180, t. 368, f. 21.

**HUILLA.**—In uliginosis editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

This species is distinguished from *S. trihedrale* Wolle (Desm. U.S. 123, pl. 40, f. 12-14 ; W. et G. S. West in Trans. Linn. Soc. 2nd ser. v. 260-1, t. xvi. f. 29) by its smaller size, its more conical semi-cells with comparatively broader apices and almost straight sides, by the form of its vertical view, and by the much smaller and more numerous markings on the membrane. *S. trihedrale* var. *rhomboideum* W. et G. S. West (*l.c.* f. 30) seems to be intermediate in form between this species and *S. trihedrale*, but it has the characteristic basal angles, the narrow apex, and the markings of *S. trihedrale*, whereas none of these characters are possessed by *S. cassidum*.

14. **S. areolatum** W. et G. S. West in Journ. Bot. 1897, p. 180, t. 367, f. 17.

**HUILLA.**—Inter *Utriculariam*, Morro de Lopollo ; April 1860. No. 179.

This is very distinct from *S. cosmarioides* Nordst. [in Vidensk. Medd. f. d. naturh. Foren. (1869), no. 14-15, 223, t. iv. f. 43 (1870)], and it is different in the form of its front view and in its membrane from any species of *Cosmarium*. Börgeesen, in Vidensk. Medd. f. d. naturh. Foren., Kjöben. 1890, 50 (1891), figures (under a wrongly stated magnification !) under the name of *S. cosmarioides* forms which he suggests may be trigonal and tetragonal forms of several species of *Cosmarium*. His fig. 2 somewhat approaches this species in form, but it has different basal angles and a very different sinus.

15. **S. scrobiculatum** W. et G. S. West in Journ. Bot. 1897, p. 181, t. 368, f. 18.

**HUILLA.**—In uliginosis editioribus prope Humpata, Empalanca et Lopollo ; May 1860. No. 15.

16. **S. punctulatum** Bréb. in Ralfs, Brit. Desm. 133, t. xxii, f. 1 (1848); W. et G. S. West in Journ. Bot. 1897, p. 181.

*Forma 3-gonata.*

PUNGO ANDONGO.—In rivulis Presidii (Casalalé); March 1857. No. 105.

*Forma 4-gonata.*

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

17. **S. dilatatum** Ehrenb. Infus. 143, t. x, f. 13 (1838); Ralfs, Brit. Desm. 133, t. xxi, f. 8 (1848); W. et G. S. West, *l.c.*

PUNGO ANDONGO.—In rivulis Presidii (Casalalé); March 1857. No. 105.

Var. **insignis** Racib. in Rosprawy Akad. Umiej. Krakow, Wydział. Mat.-przyr. ser. 2, t. ii. (vol. xxii.) 388, t. vii, f. 13 (1892); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

18. **S. hexacerum** Wittm. in Bih. t. K. Vet.-Akad. Handl. Bd. 1, no. 1, 51 (1872); W. et G. S. West, *l.c.* *Desmidium hexaceros* Ehrenb. Abhandl. Akad. Wissenschaft., Berlin, 1833, 293 (1835); Infus. 141, t. x, f. 10 (1838).

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

19. **S. micron** W. et G. S. West in Journ. R. M. S. 159, t. iv, f. 50-51 (1896).

Var. **angolense** W. et G. S. West in Journ. Bot. 1897, p. 181, t. 368, f. 19.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

20. **S. Gurgeliense** Schmidle in Oesterreich. Botan. Zeitschr. 64, t. xvi, f. 23, 24 (1896).

Var. **tropicum** W. et G. S. West in Journ. Linn. Soc. 1897, p. 182, t. 368, f. 20.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

This may be a proper species, but only one example was met with and, until further examples are obtained, it had better be regarded as a variety of Schmidle's alpine species.

21. **S. elegantissimum** Johnson in Bull. Torr. Bot. Club, xxi, 290, t. 211, f. 16 (1894).

Var. **reductum** W. et G. S. West in Journ. Bot. 1897, p. 182.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

22. **S. cerastoides** W. et G. S. West in Journ. Bot. 1897, p. 182, t. 369, f. 13.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo, plaga spongiosa unacum *Eriocauloneis*, *Xyridibus* et *Utricularia* constituta; May 1860. No. 15. Etiam in paludibus exsiccandis; April 1860. No. 176.

This species possesses in common with its nearest ally *S. Cerastes*

Lund. a smooth under surface to the processes which have a faintly recurved apex, as well as a double series of warts along each side. The character and arrangement of these warts, however, its less incurved processes, the different form of its semicells, together with the constantly fusiform vertical view, readily distinguish it.

23. **S. gracile** Ralfs in Ann. Nat. Hist. xv. 155-6, t. xi. f. 3 (1845); Brit. Desm. 136, t. xxii. f. 12 (1848).

Var. **cyathiforme** W. et G. S. West in Trans. Linn. Soc. ser. 2, v. 77, t. ix. f. 2 (1895); Journ. Bot. 1897, p. 182.

**PUNGO ANDONGO.**—In stagnis prope Anbilla (Condo); March 1857. No. 177.

Var. **pusillum** W. et G. S. West in Trans. Linn. Soc. ser. 2, v. 77, t. ix. f. 4.

**PUNGO ANDONG.**—In stagnis prope Anbilla (Condo); March 1857. No. 177.

24. **S. angolense** W. et G. S. West in Journ. Bot. 1897, p. 183, t. 368, f. 22.

**PUNGO ANDONGO.**—In stagnis prope Anbilla (Condo); March 1857. No. 177.

The nearest species to this is *S. brachyoprominens* Börg. in Vidensk. Medd. f. d. Naturh. Foren., Kjöben. (1890), 47, t. v. f. 52 (1891); W. et G. S. West in Trans. Linn. Soc. ser. 2, v. 265, t. xvii. f. 12 (1896), from which it differs in the absence of the denticulate apical verrucae and the basal rings of granules, in the presence of the two transverse rows of granules at each side, and in the somewhat shorter and thicker processes.

25. **S. quadridentatum** W. et G. S. West in Journ. Bot. 1897 p. 183, t. 369, f. 15, 16.

**HUILLA.**—In paludibus exsiccandis; April 1860. No. 176. Etiam inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

#### 14. **ARTHRODESMUS** Ehrenb. (1836).

1. **A. hiatus** W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 134, t. xi. f. 34 and 40 and t. xii. f. 1 (1893); W. et G. S. West in Journ. Bot. 1897, p. 235.

**HUILLA.**—In editis de Morro de Lopollo; Feb. 1860. No. 192.

The specimens have the minute spines almost patent and not converging: the apices are not so flattened as in Turner's figures.

#### 15. **GYMNOZYGA** Ehrenb. (1840).

1. **G. moniliformis** Ehrenb. in Bericht. Verh. Preuss. Akad. Wissenschaft, Berlin, 212 (1840); W. et G. S. West *l.c.*

*Desmidium Borreri* Ralfs in Ann. Nat. Hist. xi. 375, t. 8, f. 4 (1843). *Didymoprium Borreri* Ralfs, *l.c.*, xvi. 10 (1845); Brit. Desm. 58-9, t. iii. (1840). *Bambusina Brebissonii* Kütz. Phyc. Germ. 140 (1845).

**HUILLA.**—Inter *Utriculariam*, Morro de Lopollo; April 1860. No. 179.

## XII. VAUCHERIACE.E.

## 1. VAUCHERIA DC. (1803).

1. **V. sessilis** DC. Flor. Fr. ii. 63 (1805); Cooke, Brit. Freshw. Alg. 123, t. 46, f. 1-20 and t. 18, f. 1-5; W. et G. S. West in Journ. Bot. 1897, p. 235.

*Ectosperma sessilis* Vauch. Hist. Conferv. 31, t. ii, f. 7 (1803).

GOLUNGO ALTO. In fossis exsiccatis adhuc humidis in Varzea pone domicilium Isidri; Aug. and Sept. 1855. No. 132. Covers in Aug. and Sept. all the half-dried-up ditches of the marshy plain (Varzea).

Var. **monogyna** W. et G. S. West in Journ. Bot. 1897, p. 235.

GOLUNGO ALTO. Ad margines stagnorum rivi Cuango; Aug. 1857. No. 155.

## XIII. HYDROGASTRACE.E.

## 1. BOTRYDIUM Wallr. (1815).

1. **B. granulatum** Grey. Alg. Brit. 196, t. xix. (1830); Cooke, Brit. Freshw. Alg. 114, t. 45.

*Cladogranulata* L. Sp. Pl. 1633. *Hydrogasterum granulatum* Desv.

Var. **æquinoctiale** W. et G. S. West in Journ. Bot. 1897, p. 235.

LOANDA.—Non infrequens in territor. Loandensis terris humidis argillaceo-arenosis, latis platis imo urbis ipsius plateas etc. obtegens; mox post pluvias copiosas nascens, citoque tempore secco disparens. Ad fin. April 1854. No. 199.

Very little could be made out from the specimens, which were on dried mud, but a rough sketch made by Welwitsch accompanying them was sufficiently characteristic of the genus.

## XIV. PALMELLACE.E.

## 1. CŒLASTRUM Näg. (1849).

1. **C. robustum** Hantzsch in Rabenh. Alg. Europ. no. 1407; Reinsch in Abhandl. Naturhist. Gesellsch. Nürnberg, Bd. 3, H. 2, 88 (1866); Schmidle in Berichte der Naturfors. Gesellsch. Freib. 79, t. ii, f. 11 (1893); W. et G. S. West in Journ. Bot. 1897, p. 236.

*C. indicum* W. B. Turn. in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 161, t. xx, f. 11 (1893).

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

Var. **confertum** W. et G. S. West, *l.c.*

LIBONGO.—Cum form. typ. No. 204

## 2. SORASTRUM Kütz. (1845).

1. **S. spinulosum** Näg. Gatt. ein z. Alg. 99, t. v. D. (1849); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

3. **PEDIASTRUM** Meyen (1829).

1. **P. Tetras** Ralfs in Ann. Nat. Hist. xiv. 469, t. 12, f. 4 (1844); W. et G. S. West, *l.c.*

*Micrasterias Tetras* Ehrenb. (1838).

HUILLA.—In paludibus exsiccandis : April 1860. No. 176. *Inter Utriculariam*, Morro de Lopollo ; April 1860. No. 179.

LIBONGO.—Ad margines flum. Lifune : Sept. 1858. No. 204.

4. **OPHIOCYTIUM** Näg. (1849).

1. **O. majus** Näg. Gatt. einz. Alg. 89, t. iv. A, fig. 2 (1849); W. et G. S. West, *l.c.*

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

2. **O. parvulum** A. Br. Alg. Unicell. 55 (1855) ; W. et G. S. West, *l.c.*

*Brochidium parvulum* Perty.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

PUNGO ANDONGO.—In stagnis prope Anbilla (Condo) ; March 1857. No. 177.

5. **SCENEDESMUS** Meyen (1829).

1. **S. denticulatus** Lagerh. in Ofv. Kongl. Vet.-Akad. Förhandl. 1882, no. 2, 61, t. ii. f. 13–16.

Var. *linearis* Hansg. in Archiv. Naturwiss. Landesdurchf. Böhm. Bd. 6, no. 268 (1888) ; W. et G. S. West in Journ. Bot. 1897, p. 237.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

6. **TETRAEDRON** Kütz. (1845).

1. **T. minimum** Hansg. in Hedwigia, 1888, 131 ; W. et G. S. West, *l.c.*

*Polyedrium minimum* A. Br. in Rabenh. Fl. Europ. Alg. iii. 62.

From the references given under the name *T. minimum* in his paper in "Hedwigia" it would appear that Hansgirg was under the erroneous impression that Braun described this plant in Rabh. Fl. Europ. Alg. as a *Tetraëdron*.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

2. **T. tropicum** W. et G. S. West in Journ. Bot. 1897, p. 237.

LIBONGO.—Ad margines flum. Lifune ; Sept. 1858. No. 204.

This should be compared with *T. reticulatum* (Reinsch) Hansg. : in the latter species the membrane is not nearly so thick, and the scrobiculations are so large that the superficial part of the membrane only consists of a fine reticulation.

3. **T. tetragonum** Hansg. *l.c.* (1888).

*Polyedrium tetragonum* Näg. Gatt. einz. Alg. 84, t. iv. B, fig. 2 (1849).

Var. *inerme* (Wille in Bihang t. K. Sv. Vet.-Akad. Handl. Bd. 8, no. 18 (1884), 12, t. i. f. 25) ; W. et G. S. West, *l.c.*

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15.

4. **T. pusillum** W. et G. S. West in Journ. Bot. 1897, p. 237.

*Micrasterias pusilla* Wallich in Ann. Mag. Nat. Hist. ser. m. vol. v. 281, t. xiii, fig. 13 (1860). *Staurophoratum pusillum* W. B. Turner in K. Sv. Vet.-Akad. Handl. Bd. 25, no. 5, 159, t. xx, f. 22 (1893).

Var. **angolense** W. et G. S. West in Journ. Bot. 1897, p. 237.

LIBONGO.—Ad margines flum. Lifune: Sept. 1858. No. 204.

We see no reason for Turner's genus *Staurophoratum*, as no clear line of demarcation can be drawn between those species which it would include and those referable to *Tetraëdron*. Indeed *Tetraëdron pusillum* is very closely connected through its var. *angolense* with *T. lobulatum* (Nag.) Hassg.

5. **T. regulare** Kütz. Phyc. Germ. 129 (1845); W. et G. S. West, *l.c.*

*Polydrium tetraedricum* Nag. Gatt. ciuz. Alg. 81, t. iv, B, fig. 3 (1849).

PUNGO ANDONGO.—In stagnis prope Aubilla (Condo): March 1857. No. 177.

*Forma major* Reinsch in Abhandl. Naturhist. Gesellsch. Nürnberg, Bd. 3, H. 2, 77, t. v, fig. 2 (1866); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune: Sept. 1858. No. 204.

7. **BOTRYOCOCCUS** Kütz. (1849).

1. **B. Micromorus** W. et G. S. West in Journ. Bot. 1897, p. 238.

LIBONGO.—Ad margines flum. Lifune: Sept. 1858. No. 204.

8. **OOCYSTIS** Nag. (1855).

1. **O. Novæ Semliæ** Wille in Ofv. Kongl. Vet.-Akad. Förhandl. 1879, no. 5, 26, t. xii, f. 3; W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

Var. **maximum** West in Journ. R. M. S. 13, t. ii, f. 25 (1894); W. et G. S. West in Journ. Bot. 1897, p. 238.

This is yet a larger form than the British one.

GOLUNGO ALTO.—Ad margines stagnorum rivi Cuango: Aug. 1857. No. 155.

2. **O. solitaria** Witt. in Witt. & Nordst. Alg. Aq. Duke. Exsicc. Fase. v. no. 241; Bot. Not. 1879, 24; W. et G. S. West, *l.c.* in Journ. Bot. 1897, p. 238.

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15.

LIBONGO.—Ad margines flum. Lifune: Sept. 1858. No. 204.

*Forma major* Wille in Ofv. Kongl. Vet.-Akad. Förhandl. 1879, no. 5, 26; W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

9. **ATHROOCYSTIS** W. et G. S. West in Journ. Bot. 1897, p. 238.

1. **A. ellipsoidea** W. et G. S. West, *l.c.*

MOSSAMEDES.—In stagnis *Lemna paucicostata* tectis cum *Typha* et *Juncus* prope Aguada; July 1859. No. 131.

This alga, by reason of its small families of densely-crowded cells and the nature of its integument, differs considerably from any other genus of *Palmellaceæ*.

10. **GLÆOCYSTIS** Næg. (1849).

1. **G. gigas** Lagerh. in Ofv. Kongl. Vet.-Akad. Förhandl. 1883, no. 2, 63; W. et G. S. West, *l.c.*

*Protococcus gigas* Kütz. Phyc. Germ. 145 (1845); Verwandl. der Infus. fig. vi. 1 (1844). *Chlorococcum gigas* (Kütz.) Grun.

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

2. **G. Rupestris** Rabenh. Kryptog. Flor. Sachs. 128 (1863); W. et G. S. West in Journ. Bot. 1897, p. 239.

*Palmella rupestris* Lyngb. Tentamen Hydrophyt. Dan. 207, t. 69, fig. D (1819).

PUNGO ANDONGO.—Alga terrestris, ad ligna putrescentia in rupium convallis ipsius Presidii; Nov. 1856. No. 110.

3. **G. vesiculosa** Næg. Gatt. einz. Alg. 66, t. iv. F. (1849); W. et G. S. West, *l.c.*

LIBONGO.—Ad margines flum. Lifune; Sept. 1858. No. 204.

11. **UROCOCCUS** Kütz (1849).

1. **U. insignis** Kütz. Spec. Alg. 207 (1849); W. et G. S. West, *l.c.*

*Hematococcus insignis* Hass. Brit. Freshw. Alg. 324, t. lxxx. f. 6 (1845). *Chroococcus macrococcus* Rabenh.

HUILLA.—In paludibus exsiccandis; April 1860. No. 176.

After enumerating the characters of his "First Subgenus" of *Hematococcus* Ag., Hassall (Brit. Freshw. Alg. i. 322) says that "the term *Ouracoccus* might be applied to the species of this subgenus." Improving on this suggestion, Kützing, according to the reference on p. 206 of his "Species Algarum," establishes the genus *Urococcus* of Hassall; but it cannot be held to constitute publication of a new genus, and, if *Urococcus* is to stand, it must be as *Urococcus* Kütz. Spec. Alg. 206 (1849).

12. **STICHOCOCCUS** Næg. (1849); em. Gay (1891).

1. **S. flaccidus** Gay, Recherches quelq. Alg. Vertes, 79, t. xi. f. 101-106 (1891); W. et G. S. West, *l.c.*

*Ulothrix flaccida* Kütz. Spec. Algar. 349 (1849).

LOANDA.—Inter *Protococcus botryoides* (Kütz.) Kirchn.; Oct. 1858. No. 128.

13. **PROTOCOCCUS** Ag. (1824).

1. **P. viridis** Ag. Syst. Algar. 13 (1824); Kütz. Tab. Phyc. i. (1845-9), p. 3, t. 3; W. et G. S. West, *l.c.*

LOANDA.—Ad parietes domorum etc. saepius humectatas (also on flower-pots) in ipsa urbe Loanda, ast sparsim. Locus habitationis hujus algæ austrum versus spectat; July 1854. No. 126.

2. **P. botryoides** Kirchn. in Cohn, Kryptog. Flora Schles., Bd. 2, Erste Hälfte, 103 (1879); W. et G. S. West, *l.c.*

*Microhaloa botryoides* Kütz. Phys. General, 169 (1843); Tab. Phyc. i. (1845-9), 6, t. 7.

LOANDA.—A light green coating on the inside of wooden water reservoirs, often remaining dry, in the garden of Dr. Mendes Alfonso's house; Oct. 1858. No. 128.

### MYXOPHYCEAE.

### XV. RIVULARIACEAE.

#### 1. CALOTHRIX Ag. (1824).

1. **C. fusca** (Kütz.) Born. et Flah. in Ann. Sci. Nat., 7<sup>e</sup> série, Bot. iii. 361 (1886); W. et G. S. West, *l.c.*

*Mastichothrix fusca* Kütz. in Phyc. General, 232 (1843).

PUNGO ANDONGO.—In *Batrachospermo gracillimum* ad lapides submersas in rivo de Tangue ips. Presidii; May 1857. No. 3.

2. **C. breviarticulata** W. et G. S. West in Journ. Bot. 1897, p. 240.

PUNGO ANDONGO.—Epiphytica in *Mongolia ampolensi* ad ramiculos Podostemacearum (*Tristicha trifaria* Tul.) in rivulis Presidii (Casalalé); March 1857. No. 105.

The habit, together with the gradual attenuation of the filaments, brings this nearest to *C. adscendens* (Näg.) Born. et Flah. (*l.c.*, 365); but its smaller size, its shorter filaments, and its very short cells easily distinguish it. The younger plants, which have only attained a length of about 100  $\mu$  and a thickness of 5.5-7.5  $\mu$ ., have their cells only 2-3 times shorter than the diameter. It also comes near to *C. endophytica* Lemmermann in Forschungsberichte Biolog. Station zu Plön, iv. 184 (1896), but has a different sheath and very short filaments; the heterocysts are also very distinct.

3. **C. epiphytica** W. et G. S. West in Journ. Bot. 1897, p. 240.

MOSSAMEDES.—Epiphytica in *Edogonii* sp., freq. in stagnis puris ad ripas flum. Bero; Aug. 1859. No. 190.

#### 2. DICHOTHRIX Zamardini (1858).

1. **D. olivacea** Born. et Flah., *l.c.*, 375 (1886); W. et G. S. West, *l.c.*

*Calothrix olivacea* Hooker (1845).

PUNGO ANDONGO.—Inter *Seytonia Myoekraus* var. *chaetophylloides*, in summis rupibus Presidii; Feb. 1857. No. 6. Etiam inter *Seytonia Millii* ad rupes vulc. Immetatas prope Caella ips. Presidii; Feb. 1857. No. 7.

2. **D. gypsophila** Born. et Flah., *l.c.* 377-8 (1886); W. et G. S. West, *l.c.*

*Schizosiphon gypsophilus* Kütz. Phyc. Gener. 234, t. 6, fig. 2 (1843).

This seems to have been luxuriantly developed, and reached 5 mm. in height; the filaments were not incrusted with lime, as is often the case with this species.

PUNGO ANDONGO.—*Inter Scytonema Myochrous* var. *chorographicum*, in rupib. perpendic. ad latera boreal. et occid. de Pedra Songue ; April 1857. No. 12. *Inter Scytonema cincinnatum* var. *aethiopicum*, in pascuis spongiosis breviter graminosis juxta rupes gig. Praesidii prope Catete ; May 1857. No. 111.

3. **GLÆOTRICHIA** J. Ag. (1842).

1. **G. aethiopica** W. et G. S. West in Journ. Bot. 1897, p. 240.

MOSSAMEDES.—*Satis freq. inter Charæ speciem in rivo Caroca vel Croque prope Cabo negro* ; Sept. 1859. Nos. 19 and 173.

This species differs from *G. nutans* (Hedwig) Rabenh. Deutschl Kryptog.-Flora, 90 (1847), in the length of its cells and in its spores.

XVI. SIROSIPHONIACEÆ.

1. **HAPALOSIPHON** Nág. (1849).

In this genus the *spores* are produced from the ordinary vegetative cells of certain of the plants. They are formed from the majority of (or even all) the cells of both the primary filaments and branches of some portions of these plants, and have always thick yellowish-brown cell-walls. The outward form of the spores varies with the different species, the dimensions being about those of the vegetative cells. (Cf. also Hansgirg in Oesterreich. Bot. Zeitschr. xxxiv. 393 (1884) ; West in Journ. Linn. Soc. xxx. 272, pl. xv. f. 23-28.) In most of the species the branches arise at right angles to the main filament, and the cell of the main filament directly under the branch projects slightly into the sheath of the latter.

1. **H. luteolus** W. et G. S. West in Journ. Bot. 1897, p. 241.

HUILLA.—*Inter alias algas, in uliginosis editioribus prope Humpata, Empalanca et Lopollo, plagas spongiosas unacum Eriocauloneis, Xyridibus et Utriculariis constituens* ; May 1860. No. 15. *In graminosis paludosis juxta rivulum Lopollo* ; April 1860. No. 180. *Etiam Morro de Lopollo* ; May 1860. No. 182.

This species occurs in minute tufts, and the great resemblance to each other of the primary filaments and branches, together with their thick yellowish sheaths, characterise it.

2. **H. aureus** W. et G. S. West in Journ. Bot. 1897, p. 241.

HUILLA.—*Inter Schizotrichem fuscescens*, in paludibus exsiccandis ; April 1860. No. 176. *Etiam inter Utricularium*, Morro de Lopollo ; April 1860. No. 179.

This has a very distinct facies from *H. luteolus*, being of a bright golden brown colour, with more tortuous filaments, the sheaths of which have a very different appearance ; the cells also are much more variable (and usually longer), the branches are more numerous and of a thickness different from that of the primary filaments, and often arise in pairs.

3. **H. intricatus** West in Journ. Linn. Soc. xxx. 271-2, pl. xv. f. 16-28 (1894) ; W. et G. S. West in Journ. Bot. 1897, p. 242.

An aquatic form ; spores rectangular oblong,  $1\frac{1}{2}$ -3 times longer than broad.

HUILLA.—*In cæspitibus parvis intricatis inter H. luteolum*, in uligi-

nosis editioribus, prope Humpata, Empalanea et Lopollo May 1860 No. 15.

4. **H. Welwitschii** W. et G. S. West in Journ. Bot. 1897, p. 212.

PUNGO ANDONGO.—Inter *Botriochlorpermum griseolum* in rivulo de Tangue ips. Presidii; May 1857. No. 3.

This species may be compared with *H. hibernicus* W. et G. S. West (in Journ. R. M. S. 1896, 163), from which it differs in the longer cells of the primary filaments: in having much fewer branches, which are also shorter and not flexuose; moreover, the cells of the branches, as well as the heterocysts, never attain the length of those of *H. hibernicus*. Compare also with *H. intricatus* West.

2. **STIGONEMA** Ag. (1821).

The cells of this genus are protoplasmically continuous throughout the whole plant, a fine strand of protoplasm, passing from cell to cell along the middle of the filament, effecting this continuity. This is best seen in plants that have been dried and soaked out, the cells then appearing like beads on a string. These connecting threads are not visible in living plants, but in becoming dry the protoplasm shrinks away from the minute canal along which it passes through the septa, and on soaking again does not reattain its natural position.

1. **S. ocellatum** Thür. in Ann. Sc. Nat. 6<sup>e</sup> ser. Bot. i. 380 (1875); W. et G. S. West in Journ. Bot. 1897, p. 243.

*Conferra ocellata* Dillw. Brit. Conferv. 60. 1, Supp. pl. n (1809). *Sirosiphon ocellatus* Kütz. Spec. Algar. 317 (1849); Tab. Phyc. ii. (1850-2), 11, t. 37, f. ii.

PUNGO ANDONGO.—A small form: in small quantity amongst *Zygmyces* sp., growing on tufts of *Seytonema Myochrous* var. *chromaticum*, on rocks on the northern and western sides of Pedra Songue: April 1857. No. 153.

*Formatum major* W. et G. S. West in Journ. Bot. 1897, p. 243.

A large and finely developed aquatic form.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo: April 1860. No. 179. In paludibus exsiccandis: April 1860. No. 176.

2. **S. flexuosum** W. et G. S. West in Journ. Bot. 1897, p. 213.

HUILLA.—Inter *Hypalosiphonem latolatum* et *Microsporidum Lophigerum*, etc., in uliginosis editioribus prope Humpata, Empalanea et Lopollo, plagas spongiosas unacum *Eriocauloneis*, *Xyridibus*, et *Utricularia* constitutis: May 1860. No. 15. Etiam Morro de Lopollo: May 1860. No. 182.

This is distinguished from *S. panniforme* (Ag.) Born. et Flah. by its habit, its very different branching, its almost colourless sheath with smooth exterior, and by the round apices of the branches, as well as by its somewhat smaller size.

3. **S. minutum** Hass. Brit. Freshw. Alg. i. 230; ii. t. lxvii. f. 3, 4 (1845); Born. et Flah. in Ann. Sc. Nat. 7<sup>e</sup> série, Bot. v. 72-74 (1887); W. et G. S. West in Journ. Bot. 1897, p. 213.

*Seytonema minutum* Ag. Synop. Algar. Scand. 117 (1817).

HUILLA.—In graminosis paludibus juxta rivulum de Lopollo: April 1860. No. 180.

4. **S. informe** Kütz. Spec. Algar. 319 (1849); Tab. Phyc. ii. (1850-2), 11, t. 38, fig. iii.; Born. et Flah., *l.c.*, 75-77 (1887); W. et G. S. West in Journ. Bot. 1897, p. 243.

PUNGO ANDONGO.—Inter *Scytonema Myochrous* var. *chorographicum*, in summis rupib. Praesidii (Pedras negras); Feb. 1857. No. 6.

### 3. NOSTOCHOPSIS Wood (1869).

1. **N. lobatus** Wood in Proc. Amer. Phil. Soc. Philadelphia, 127 (1869); in Smithson. Contrib. Knowl. (1874), iii. 45, t. iii. f. 6; Born et Flah., *l.c.*, 80 (1887); W. et G. S. West in Journ. Bot. 1897, p. 264.

GOLUNGO ALTO.—Ad rupes inundatas in rivulo Muria pr. Muria sparsius; Sept. 1854. No. 201.

The examples of this are very fine, and agree well with the figure given by Wille (in Bihang t. K. Sv. Vet.-Akad. Handl. Bd. 8, no. 18, t. i. f. 1-19), with the exception of the cell-walls; portions only were as moniliform as the previously-found African examples. (Cf. W. et G. S. West in Journ. Bot. 1896, 381, t. 361, f. 1-2).

The cell-walls are very thin indeed, not any more appreciable than the cell-walls in the ordinary vegetative cells of a *Nostoc*. The majority of the heterocysts are lateral, globose, and either sessile or stalked (usually supported on one or two cells); sometimes they are intercalary, and then they are always elliptic-oblong.

## XVII. SCYTONEMACEÆ.

### 1. SCYTONEMA Ag. (1824).

1. **S. cincinnatum** Thur. in Ann. Sci. Nat. 6<sup>e</sup> série, Bot. i. 380 (1875); Born et Flah., *l.c.*, 89 (1887).

*Calothrix lanata* Kütz. Algar. Aq. Dule. Dec. I. no. 5 (1833).

Var. *aethiopicum* W. et G. S. West in Journ. Bot. 1897, p. 264.

PUNGO ANDONGO.—Alga nigrescens, lubrica, tenax, rhizomata Xyridearum aliarumque plant. palustrium, in spongiosis crescentium, crassis membranis obducens, matricibus tenaciter adhaerens—sicque imprimis loca spongiosa formans. Cum *Dichotricha gypsophila* et *Mougeotia irregularis* in pascais spongiosis breviter graminosis juxta rupes gig. Praesidii prope Catete; May 1857. No. 111.

2. **S. rivulare** Borzi in Nuovo Giornale Bot. Ital. xi. 373 (1879) Born. et Flah., *l.c.*, 91 (1887); W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Ad muscos rupestres rivulos crescentes perrepens, in Mimosarum sylvis pr. Pedras de Guinga; Jan. 1857. No. 13.

Stratum golden-brown or violet; branches rather scarce, usually solitary, short, a little narrower than the primary filaments; cells sometimes a little longer than the diameter; sheaths constantly asperulate.

This is a most interesting species, having been previously seen only from Italy by its original describer.

3. **S. Arcangelii** Born. et Flah., *l.c.*, 92 (1887); W. et G. S. West in Journ. Bot. 1897, p. 265.

GOLUNGO ALTO.—Ad muscos prope fontem magn. ad Banza de Sobato de Bango sitam; Sept. 1855. No. 159.

The following may be a larger form of this species. —

**GOLUNGO ALTO.**—Filaments forming somewhat irregular penicillate tufts of a brown colour. Crass. fil. 23-25  $\mu$ ; crass. trich. 145-17  $\mu$ . The specimens were not in a condition for satisfactory identification. Ad fontem prope Banza de Bango, socialis cum Anthocero, etc. Sept. 1855. No. 158.

4. **S. Millei** Born, in Born, et Thür. Notes Algolog. 117 (1880); Born et Flah., *l.c.*, 93 (1887); W. et G. S. West in Journ. Bot. 1897, p. 265.

Heterocysts sometimes subquadrate.

**PUNGO ANDONGO.**—Ad rupes vulc. humectatas prope Caecula ips. Presidii, inter *Dichotrichum olivaceum*; Feb. 1857. No. 7.

5. **S. ambiguum** Kütz. Spec. Algar. 891 (1819); Tab. Phyc. ii. (1850-2), 7, t. 26, f. ii.; Born, et Flah., *l.c.*, 100 (1887); W. et G. S. West in Journ. Bot. 1897, p. 265.

**PUNGO ANDONGO.**—Inter *S. Myochrous* var. *chorographicum*; Feb. 1857. No. 6.

The heterocysts are about three times longer than broad, and sometimes as many as three together.

6. **S. figuratum** Ag. Syst. Algar. 38 (1821); Born, et Flah., *l.c.*, 101-3 (1887); W. et G. S. West, *l.c.*

**HUILA.**—In uliginosis editioribus prope Humpata, Empalane et Lopollo; May 1860. No. 15. In graminosis paludibus juxta rivulum de Lopollo; April 1860. No. 180.

7. **S. Myochrous** Ag. Dispos. Algar. Suec. 38 (1812); Born, et Flah., *l.c.*, 104-6 (1887).

*Conferv. Myochrous* Dillw. Brit. Conferv. 37, t. 19 (1802).

Var. **chorographicum** W. et G. S. West in Journ. Bot. 1897, p. 265.

**PUNGO ANDONGO.**—Freq. et temp. pluv. (Dec. usque Apr.) late vegetans, in summis rupibus Presidii; Feb. 1857. No. 6. Alga erecta vel decumbens, cæspitose crescens, filamentis oculo nudo nigris, penicillatim e centro adh. radiantibus, mox latas rupium gigant. plagas, imprimis verticales, colore atro tingens, qua ex causa *Pedras negras* de Pungo Andongo.

Etiam ad latera boreal. et occid. de Pedra Songue; April 1857. No. 12. Alga terrestris vel potius rupestris, eximie gregaria, incrementi rapidissimi, juventute et tempore per dies nebuloso atrovirens, solis luce et nidore cito nigrescens, latissimas rupium plagas perpendiculares colore aterrimo tingens.

This agrees in every particular with *S. Myochrous*, with the exception that the filaments are never ocreate. From *S. figuratum* it differs in being of larger dimensions, and in having a relatively thicker sheath.

8. **S. insigne** W. et G. S. West in Journ. Bot. 1897, p. 266.

**GOLUNGO ALTO.**—Ad rupes madidas in umbrosis juxta rivum Coango inter Sange et Undelle, nunc violaceo-viridis, nunc intensius violacea; May 1856. No. 5. Etiam ad rupes rivul. Coango humect. pulvinula livido-cinerea spongiosa formans; June 1856. No. 140.

This plant is noticeable for the variability of its filaments, some

having parallel margins with long cells, others having firm irregular margins with somewhat torulose trichomes, consisting of very short transversely elliptic cells of irregular size. The latter filaments much resemble the branches of a *Stigmema*. The sheaths of this plant are altogether remarkable, being quite colourless, and often very irregular in the margin: wherever they come in contact with each other they appear to coalesce, and this coalescence gives rise to a phenomenon (viz. the apparent inclusion of two parallel trichomes in the same sheath) which, so far as we are aware, has not been previously noticed in this genus. The branches are also most peculiar, the majority being solitary, and given off laterally from one cell of the primary filament precisely as in *Hapalosiphon*. Taking into consideration all these points, there are still unmistakable characters which place the plant in the genus *Scytonema*.

## 2. **TOLYPOTHRIX** Kütz. (1843).

After examining the three following species, we cannot agree with Bornet and Flahault in separating the genera *Hassallia* and *Tolypothrix*. The former is said to be distinguished from the latter by its fragile filaments and its terrestrial habit. The three species referred to are all terrestrial as described for *Hassallia*, but the sheaths (especially that of *T. crassa*) are very firm, persistent, and flexible, agreeing with those of *Tolypothrix*. Under which genus ought these species to be placed? The terrestrial habit points to *Hassallia*, the flexible and non-fragile filaments to *Tolypothrix*. It appears to us that the only character left to separate the two supposed genera is the fragility of the sheaths, which in itself is certainly an insufficient generic distinction.

### 1. **T. crassa** W. et G. S. West in Journ. Bot. 1897, p. 267.

PUNGO ANDONGO.—Ad dextr. flum. Cuanza locis palustribus inter Lythraceas, etc. prope Candumba; March 1857. No. 11.

### 2. **T. phyllophila** W. et G. S. West in Journ. Bot. 1897, p. 267.

GOLUNGO ALTO.—Ad folia viva *Rinorea* (*Alsodeia*) spec. e Violacearum familia, in sylvis densis de Alto Queta; Dec. 1855 (*Sine numero*).

The nearest species to this is *T. byssoides* (Hass. Brit. Freshw. Alg. i. 233-4; ii. t. lxvii, f. 5), from which it differs in its much thicker colourless sheath, which is not fragile, and in the usually longer cells.

### 3. **T. arenophila** W. et G. S. West in Journ. Bot. 1897, p. 267.

PUNGO ANDONGO.—Ad terram arenoso-humosam in editissimis rupibus Praesidii, Pedra Cazella, cum *Schizotricha delicatissima*; Jan. 1857. No. 151.

### 4. **T. limbata** Thur. in Born. et Flah. in Ann. Sci. Nat. 7<sup>e</sup> série, Bot. v. 124 (1887); W. et G. S. West, *l.c.*

A smaller form with yellowish brown sheaths, which are often somewhat rough on the exterior.

MOSSAMEDES.—Cum *Oscillatoria tenui* in umbrosis muscosis ad ripam fluminis Bero, etiam in stagnis profundis post pluvias remanentibus pellucidas late virides natantes formans, prope Cavalheiros; Aug. 1859. No. 191.

## XVIII. NOSTOCÆ.

1. **NOSTOC** Vauch. (1803).1. **N. repandum** W. et G. S. West in Journ. Bot. 1897, p. 267.

PUNGO ANDONGO.—Freq. ad rupes editiores vulcan. Presidi prope Cabondo tempore pluvio, intra dies duas tresve ingente copia obvia. Feb. 1857. No. 21.

The nearest species to this is *N. humifusum* Carm., from which it is distinguished by its very large coriaceous non-tuberulate thallus, by its constantly elliptical or doliform cells, and by its larger heterocysts and spores.2. **N. paradoxum** Welw. ex W. et G. S. West in Journ. Bot. 1897, p. 268.

PUNGO ANDONGO.—Ad museos dense cespitosos juxta rivulos prope Pedra Songue in ips. Presidio; April 1857. No. 20.

This species belongs to that division of the section *Humifusa* with cylindrical cells.3. **N. muscorum** Ag. Dispos. Algar. Suec. 41 (1812); Kütz. Tab. Phyc. ii. (1850-2), 2, t. 5, f. iv.; Born. et Flah., *l.c.*, vii. 200 1 (1888); W. et G. S. West, *l.c.*

PUNGO ANDONGO.—Ad rupes schist. pr. Candumba-Calundo; Jan. 1857. No. 22. Cambondo ad rupes; Feb. 1857. No. 285.

4. **N. minutum** Desmaz. Plantes Cryptog. du Nord de la France, fasc. xi. no. 501 (1831); Born. et Flah., *l.c.*, 209 (1888); W. et G. S. West, *l.c.*

This is not identified with certainty, as it was seen in very small quantity; spores elliptical, concatenate.

MOSSAMIDES.—Inter *Edogonii* sp. in stagnis puris ad ripas flum. Bero; Aug. 1859. No. 190.2. **ANABÆNA** Bory (1822).1. **Anabænæ** sp. W. et G. S. West, *l.c.*

GOLINGO ALTO.—Specimens very fragmentary, and spores not attached to the trichomes.

Freq. sed cito marcescens ad latera rivuli Coango; Aug. 1857. No. 163.

## XIX. CAMPTOTRICHEÆ.

W. et G. S. West in Journ. Bot. 1897, p. 268.

1. **CAMPTOTHRIX** W. et G. S. West, *l.c.* p. 269.1. **C. repens** W. et G. S. West, *l.c.*HUILA.—Epiphytica supra *Schizotrichum nutans* et *Microcoleum saccatum*, in uliginosis editioribus prope Humpata, Empalanca et Lopollo, plaga spongiosa unacum *Eriocauloneis*, *Nyridibus* et *Utriculariis* constituta, 5000 ad 5500 ped. elevat.; May 1860. No. 15.The diverse forms of the cells and their irregular disposition in the short tapering filaments give a character to this genus not possessed by any other of the genera of either the *Vaginariae* or the *Lugubrieæ*, and necessitated the plant being placed as the type of a new order (*Camptotrichæ*) of *Hormogonea Homocystea*.

## XX. VAGINARIE.E.

1. **SCHIZOTHRIX** Kütz. (1843).

1. **S. elongata** W. et G. S. West in Journ. Bot. 1897, p. 269.

HUILLA.—*Inter Halosiphonem luteolum et Microsporum Löfgrenii*, etc., in uliginosis editioribus prope Humpata, Empalanca et Lopollo : May 1860. No. 15.

This differs from the other allied species in several noteworthy features, such as the extremely long flexuose attenuate filaments with few branches, the long cells, and the somewhat close cylindrical sheath.

2. **S. delicatissima** W. et G. S. West in Journ. Bot. 1897, p. 269.

PUNGO ANDONGO.—*Cum Tolypotricha arenophila*, ad terram arenosohumosam in editissimis rupibus Praesidii, Pedra Cazella : Jan. 1857. No. 151.

This species is very easily overlooked on account of its minute size and delicacy.

3. **S. Friesii** Gomont in Ann. Sci. Nat. 7<sup>e</sup> série, Bot. xv. 316–18, t. 9, f. 1, 2 (1892) ; W. et G. S. West in Journ. Bot. 1897, p. 270. *Oscillatoria Friesii* Ag. Synops. Algar. Scand. 107 (1817).

HUILLA.—Alga gelatinosa, badio-fusca, folia Xyridearum in editis de Morro de Lopollo obducens : Feb. 1860. No. 192.

4. **S. thelephoroides** Gomont, l.c., 319, 320, t. 10, f. 1–4 (1892) ; W. et G. S. West, l.c.

*Scytonema? thelephoroides* Montagne, l.c., 2<sup>e</sup> sér. Bot. xii. 45 (1839).

HUILLA.—In paludibus exsiccandis : April 1860. No. 176.

A few small examples of this species occurred in this gathering : we should like to have seen more of it, as it appears to be an aquatic form of the species.

5. **S. fuscescens** Kütz. Phyc. Gener. 230 (1843) ; Gomont, l.c., 324–5, t. 11, f. 4–6 (1892) ; W. et G. S. West, l.c.

HUILLA.—Freq. apud *Halosiphonem aureum*, in paludibus exsiccandis : April 1860. No. 176. Etiam in graminosis paludosis juxta rivulum de Lopollo : April 1860. No. 180.

Var. **africana** W. et G. S. West in Journ. Bot. 1897, p. 270.

HUILLA.—Terrestris, cum *Porphyrosiphone Notarisii*, in pascuis pluv. autumnalibus frequentius inundatis, demum exsiccantibus, ad lacum magnum de Ivantala : March 1860. No. 18.

6. **S. natans** W. et G. S. West in Journ. Bot. 1897, p. 270.

HUILLA.—*Inter Microsporum Löfgrenii*, etc., in uliginosis editioribus prope Humpata, Empalanca et Lopollo ; plaga spongiosa unacum Eriocauloneis, Xyridibus et Utriculariis constituens ; May 1860. No. 15. Morro de Lopollo ; May 1860. No. 182. Etiam in graminosis paludosis juxta rivulum de Lopollo ; April 1860. No. 180.

The nearest species to this is *S. purpurascens* (Kütz.) Gomont, l.c. 320–1, t. 9, f. 6–8, from which it is distinguished by the much fewer branches of its more elongate filaments, its differently coloured sheaths which are much more attenuate at the apices (not acuminate), its less numerous and more elongate trichomes not constricted at the

dissepiments, and in the cells never being shorter than the diameter as well as in its subsolitary free-swimming habit.

## 2. **PORPHYROSIPHON** Kütz. (1850: 52).

1. **P. Notarisii** Kütz. Tab. Phyc. ii. (1850: 2), 7, t. 27, f. i.; W. et G. S. West, in Journ. Bot. 1897, p. 271.

This interesting and characteristic alga appears to have been abundant in the district traversed by Welwitsch.

**PUNGO ANDONGO.**—Alga terrestris, latissimas palustrum terrarum plaga colore sanguineo-ferrugineo tingens, prope Condo: March 1857. No. 9. Alga cespitosa, glauco-viridis, inter muscorum cespites in cryptis editiorum montis de Cazella crescens: Dec. 1856. No. 107. (These specimens appear to be old ones: many of the sheaths were empty, and the red colour has mostly disappeared.)

**HUILLA.**—In udis sylvaticis et apriis inter Monino et lac. Ivantala latas plaga colore fusco-sanguineo obducens: April 1860. No. 14. Frequens in pascuis pluv. autumnalibus frequentius inundatis, demum exsiccatibus, ad lacum magnum de Ivantala: March 1860. Nos. 17 and 18. "Alga terrestris, atro- vel fusco-sanguinea, late cespitosa, cespitibus lubricis planis e filamentis tenacibus dense intertextis et contextis versus marginem radiantibus conflatis, terrae arete adhaerentibus: loca, ubi frequens olvia haec Alga, tempore spongiosa facta multis aliis stirpibus uliginosis solum praebeat."

This Alga occasionally branches: these branches are few and of the same thickness as the primary filament, around which they are closely coiled. The sheath of the branch becomes solid at the base, and is gradually merged into that of the primary filament, its trichome not being in any way connected with that of the latter. The branching really consists of a close application of the base of one filament to the sheath of another, the fusion being for such a short distance that the two trichomes are never present within the same sheath. It is of the same type as the branching present in *Schizothrix*, but the division into branches is deeper, causing the branches and primary filaments to be of equal thickness. The above remarks prove that *Porphyrosiphon* is very closely related to *Schizothrix*, and emphasizes its position in the *Vaginariae*. This affinity was inferred by Gomont (in Ann. Sci. Nat. 7<sup>e</sup> série, Bot. xv. 332) from a consideration of an entirely different character, viz. the structure of the sheath. Gomont's statement on the same page that *Porphyrosiphon* has no branches is, however, erroneous.

## 3. **POLYCHLAMYDUM** W. et G. S. West in Journ. Bot. 1897, p. 271.

1. **P. insigne** W. et G. S. West in Journ. Bot. 1897, p. 271, t. 365, f. 1, 2.

**LOANDA.**—Ad *Nitella* et *Najadum* in lacu de Quifandongo Dec. 1853. No. 195.

The peculiar sheaths of this genus readily distinguish it from the other genera of the *Vaginariae*, its nearest ally being *Dasyglaua* Thw., from which it differs in the very firm multitubular sheath with an open apex, and in the much thicker trichomes with very much shorter cells. There is a very distinct line of demarcation between the inner and outer constituents of the sheath, the outermost one being rendered conspicuous only by the extraneous material adhering to it. The trichomes are also usually without any interruption for a considerable length.

4. **MICROCOLEUS** Desmaz. (1823).

1. **M. vaginatus** Gomont in *Journ. de Botaniq.* iv. 353 (1890); in *Ann. Sci. Nat.* 7<sup>e</sup> série, *Bot.* xv. 355–8, t. 14, f. 12 (1892).

*Oscillatoria ruginata* Vanch. *Hist. Conferv.* 200–1, t. xv. f. 13 (1803).

Var. **monticola** (Kütz.) Gomont in *Ann. Sci. Nat.*, *l.c.*, 356 (1892); W. et G. S. West in *Journ. Bot.* 1897, p. 272.

**PUNGO ANDONGO**.—Inter *Porphyrosiphonem Notarisii* et *Lyngbyam aeruginoso-cæruleam*, prope Condo; March 1857. No. 9.

2. **M. sociatus** W. et G. S. West in *Journ. Bot.* 1897, p. 272.

**HUILLA**.—Inter *Schizotrichem mutantem* et *Microsporam Lüfgrenii*, in uliginosis editioribus prope Humpata, Empalanca et Lopollo; May 1860. No. 15.

This differs from *M. lacustris* (Rabenh.) Farlow in its narrower trichomes with cylindrical cells, its acutely conical apical cells, and in its firmer sheaths.

## XXI. LYNGBYÆ.

1. **SYMPLOCA** Kütz. (1843).

1. **S. Muscorum** Gomont in *Journ. de Botaniq.* iv. 354 (1890); in *Ann. Sci. Nat.* 7<sup>e</sup> série, *Bot.* xvi. 110–12, t. 2, f. 9 (1892); W. et G. S. West in *Journ. Bot.* 1897, p. 297.

*Oscillatoria Muscorum* Ag. *Syst. Algar.* 65 (1824).

(a) Crass. trich. 5·5–6  $\mu$ .

**LOANDA**.—Ad terram humidam urbis Loandæ, tempore pluvio: April 1854. No. 161.

(b) Crass. trich. 8–9  $\mu$ .

**HUILLA**.—Alga atro-viridis, viscosa-gelatinosa, exsiccata fere penicilliformis, inter muscos (*Bryum* No. 25) texta, in maxime umbrosis; Morro de Monino; Feb. 1860. No. 181.

2. **LYNGBYA** C. Ag. (1824).

1. **L. aureo-fulva** W. et G. S. West in *Journ. Bot.* 1897, p. 298.

**PUNGO ANDONGO**.—Freq. in humidis ad dextram flum. Cuanza ex Candumba usque Quisonde; March 1857. No. 10. “Alga terrestris, in vivo aureo-fulva vel flavescens, membranis spongiosis latissimis graminum cæspitibus intertexta, Drosaceis et Eriocaulonaceis solum spongiosum offerens.”

2. **L. Martensiana** Menegh. *Conspect. Algol. Eugan.* 12 (1837): Gomont in *Ann. Sci. Nat.* 7<sup>e</sup> série, *Bot.* xvi. 145–6, t. 3, f. 17 (1892); W. et G. S. West, *l.c.*

**GOLUNGO ALTO**.—Ad muscos prope fontem magn. ad Bança do Sobato de Bango; Sept. 1855. No. 159.

**LOANDA**.—Cum *Symploca Muscorum* ad terram humidam urbis Loandæ, tempore pluvio; April 1854. No. 161.

3. **L. æruginoso-cærulea** Gomont, *l.c.*, 146–7, t. 4, f. 1–3 (1892); W. et G. S. West, *l.c.*

*Oscillaria æruginoso-cærulea* Kütz. *Phyc. Gener.* 185 (1843); *Tab. Phyc. i.* (1845–9), 28, t. 39, fig. ix.

PUNGO ANDONGO.—*Inter Porphyriosepiadum Naturae* prope Condo March 1857. No. 9.

4. **L. versicolor** Gomont, *l.c.*, 117, t. 1, fig. 1, 5 (1892); W. et G. S. West, *l.c.*

*Phormidium versicolor* Wartm. (1861).

MOSSEMEDES.—*Ad ripas limosas humi.* Bero pr. Cavalheiros : June 1859. No. 175.

3. **PHORMIDIUM** Kütz. (1843).

1. **P. subsolitarium** W. et G. S. West in Journ. Bot. 1897, p. 298.

PUNGO ANDONGO.—*In Batrachospermo gracillimo* ad lapides submersas in rivulo de Tangue ips. Praesidii : May 1857. No. 3.

The moniliform cells and the delicate hyaline sheath place this plant in the genus *Phormidium*, although the plants often occur singly. The elliptic cells and subsolitary habit characterise the species.

2. **P. angustissimum** W. et G. S. West in Journ. Bot. 1897, p. 298.

MOSSEMEDES.—*Inter Gliotrichiam aethiopicum et Charace sp.* in rivo Caroca prope Cabo Negro : Sept. 1859. No. 19.

PUNGO ANDONGO.—*Inter Nostoc repandum* ad rupes editiores vulcan. Praesidii prope Cabondo tempore pluvio : Feb. 1857. No. 21.

This narrow species is nearest to *P. laminosum* (Ag.) Gomont, but it is distinguished by its much narrower trichomes, which are constricted at the dissepiments, and its usually much longer cells.

3. **P. laminosum** Gomont in Journ. de Botaniq. iv, 355 (1890); in Ann. Sci. Nat., 7<sup>e</sup> série, Bot. xvi. 167 8, t. 1, f. 21, 22 (1892); W. et G. S. West, *l.c.*, p. 299.

*Oscillatoria laminosa* Ag. in Flora, x. 633 (1827).

GOLUNGO ALTO.—*Ad terram limosam post pluvias* : Dec. 1855. No. 166.

4. **P. Corium** Gomont in Journ. de Botaniq. iv. 365 (1890); in Ann. Sci. Nat., *l.c.*, 172 3, t. 5, f. 1, 2 (1892); W. et G. S. West, *l.c.*

*Oscillatoria Corium* Ag. Dispos. Algar. Suec. 36 (1812).

SIERRA LEONE.—*Cum Oscillatoria animali* ad parietes humid. verticales urbis Freetown freq. latissimis plagiis atro-intentibus parietes obducens : Sept. 1853. No. 167.

5. **P. papyraceum** Gomont in Journ. de Botaniq. iv. 355 (1890); in Ann. Sci. Nat., *l.c.*, 173 5, t. 5, f. 3, 4 (1892); W. et G. S. West, *l.c.*

*Oscillatoria papyracea* Ag. Syst. Algar. 61 (1824).

SIERRA LEONE.—*Ad museos (hepaticas) humidos in domicil. parietibus verticalibus urbis Freetown frequens tempore pluvio* : Sept. 1853. No. 174.

6. **P. Retzii** Gomont in Journ. de Botaniq. iv. 355 (1890); in Ann. Sci. Nat., *l.c.*, 175 8, t. 5, f. 6, 9 (1892); W. et G. S. West, *l.c.*

*Oscillatoria Retzii* Ag. Dispos. Algar. Suec. 36 (1812).

PUNGO ANDONGO.—*Ad museos (Jungermannias) submersas in rivulo Tangue pr. Catete* : May 1857. No. 165.

7. **P. autumnale** Gomont in Ann. Sci. Nat., *l.c.*, 187-190, t. 5, f. 23, 24 (1892).

*Oscillatoria autumnalis* Ag., *l.c.*, 36 (1812).

*Forma tenuis* W. et G. S. West. in Journ. Bot. 1897, p. 299.

GOLUNGO ALTO.—Cum *P. laminoso* ad terram limosam post pluvias ; Dec. 1855. No. 166.

4. **PROTERENDOTHRIX** W. et G. S. West in Journ. Bot. 1897, p. 299.

1. **P. scolecoidea** W. et G. S. West, *l.c.*

HUILLA.—In *Porphyrosiphone Notarisii*, prope lac. Ivantala ; March 1860. Nos. 17 and 18.

This genus must be placed in the *Lyngbyea* on account of the structure of the sheath, which contains a solitary trichome. The comparative width of the sheath, its hyaline character with irregular margin, along with the peculiar habit of the plant, characterise the genus. The younger plants (consisting of short filaments of 12-20 cells) are endophytic, occurring between the lamelleæ of the sheath of *Porphyrosiphon*. As they increase in size they appear to break through the outer lamelleæ of the sheath of the host, and to attach themselves closely to its outer surface by means of their own mucous envelope, which is now considerably broader.

5. **OSCILLATORIA** Vauch. (1803).

1. **O. limosa** Ag. Dispos. Algar. Suec. 35 (1812) ; Gomont in Ann. Sci. Nat. 7<sup>e</sup> série, Bot. xvi. 610-2, t. 6, f. 13 (1892) ; W. et G. S. West in Journ. Bot. 1897, p. 300.

SIERRA LEONE.—Ad terram et parietes juxta fontes prope Freetown : Sept. 1853. No. 168.

2. **O. tenuis** Ag. Algar. Decas ii. 25 (1813) ; Gomont, *l.c.*, 220-1, t. 7, f. 2-3 (1892) ; W. et G. S. West, *l.c.*

INS. PRINCIPIS.—In stagnantibus prope Bahia de S. Antonio, ad limum subexsiccatum late cæspitosa ; Sept. 1853. No. 169.

MOSSAMEDES.—Cum *Tolyptothrix limbata* in stagnis profundis prope Cavalheiros : Aug. 1859. No. 191.

3. **O. animalis** Ag. in Flora, x. 632 (1827) ; Gomont, *l.c.*, 227-9 t. 7, f. 13 (1892) ; W. et G. S. West, *l.c.*

SIERRA LEONE.—Cum *Phormidio Corium* ad parietes humid. verticales urbis Freetown, freq. latissimis plagis atro-nitentibus parietes obducens ; Sept. 1853. No. 167.

4. **O. formosa** Bory, Dict. Class. d'Hist. Nat. xii. 474 (1827) ; Gomont, *l.c.*, 230-1, t. 7, f. 16 (1892) ; W. et G. S. West, *l.c.*

LOANDA.—In limo humido urbis Loandæ ; April 1858. No. 170.

5. **O. Okeni** Ag. in Flora, x. 633-4 (1827) ; Gomont, *l.c.*, 232 t. 7, f. 18 (1892) ; W. et G. S. West, *l.c.*

LOANDA.—In fonte tepida, sulphate (ferri ?) abundanti, pr. S. Pedro freq. ; July and Aug. 1854. No. 164.

6. **O. angustissima** W. et G. S. West in Journ. Bot. 1897, p. 300.

LOANDA.—Cum *O. Okeni* in fonte tepida, sulphate (ferri ?) abundanti, pr. S. Pedro freq. ; July and Aug. 1854. No. 164.

The specimens of this species are very fine: it is a totally distinct plant from *Phormidium angustissimum*, though it is of the same thickness. It possesses no sheath, and the trichomes are much firmer and not so tortuous as those of the latter; its cells also are shorter and more indistinct.

## XXII. CHAMASIPHONACEAE.

### 1. SPHÆROGONIUM Rostaf. (1883).

1. **S. incrustans** Rostaf. in Rosprawy Sprawozd. Posiedz. Akad. Umiej. x. 282, 304-5, t. v. f. 1-7 (1883); W. et G. S. West in Journ. Bot. 1897, p. 301.

*Chamasiphon incrustans* Grun. in Rabenh. Flor. Europ. Alg. ii. 149.

PUNGO ANDONGO.—Epiphyticum supra *Zygænum crenatum* ad Podostemaceas (*Tristicha trifolia* Tul.) in riv. de Cabondo: Feb. 1857. No. 108.

## XXIII. CYSTOGONEAE.

### 1. DERMOCARPA Trouan (1858).

1. **D. depressa** W. et G. S. West in Journ. Bot. 1897, p. 301.

LOANDA.—Epiphytica supra *Pithophoram radiatum* in aquariis aquae subdulcis insule Cassanga pr. Morro da Crnz: April 1854. No. 197.

## XXIV. CHROOCOCACEAE.

### 1. GLÆOTHECE Nüg. (1849).

1. **G. confluens** Nüg. Gatt. einz. Alg. 58, t. i. 6, f. 1 (1849); W. et G. S. West, *l.c.*

GOLUNGO ALTO.—Cum *Chroococco schizodermatico* var. *badio-purpureo*, ad rupes juxta riv. Coango: June 1856. No. 139.

### 2. MERISMOEDIA Meyen (1839).

1. **M. glauca** Nüg., *l.c.*, 55, t. i. 6, f. 1 (1849); W. et G. S. West, *l.c.*

*Gonium glaucum* Ehrenb.

HUILLA.—Inter *Utriculariam*, Morro de Lopollo: April 1860. No. 179.

2. **M. hyalina** Kütz. Phyc. Germ. 142 (1845); Tab. Phyc. v. 12, t. 38, f. i. (1855); W. et G. S. West, *l.c.*

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

### 3. TETRAPEDIA Reinsch (1867).

1. **T. aversa** W. et G. S. West in Journ. Bot. 1897, p. 301.

PUNGO ANDONGO.—In stagnis prope Ambilla (Condo): March 1857. No. 177.

### 4. GLÆOCAPSA Kütz. (1843); em. Nüg. (1849).

1. **G. gelatinosa** Kütz. Phyc. Gener. 174 (1843); Tab. Phyc. i. (1845-9), 15-16, t. 20, f. vi. <sup>b</sup>; Rabenh. Flor. Europ. Alg. ii. 39, W. et G. S. West, *l.c.*

The integuments were very fine, and occasionally of a yellowish colour.

AMBACÁ.—Alga rupestris, latus plagas rupium cavernae Puricacarambola internarum colore viridissimo tingens; Oct. 1856. No. 154.

2. *G. punctata* Näg. Gatt. einz. Alg. 51, t. i. f. 6 (1849); W. et G. S. West in Journ. Bot. 1897, p. 302.

GOLUNGO ALTO.—Cum *G. rupestris*, ad saxa mollia juxta cataractam riv. Coango prope Sange, pone domicil. Domini Velho Castro: Sept. 1856. No. 134.

3. *G. rupestris* Kütz. Tab. Phyc. i. (1845-9), 17-18, t. 22, f. ii.; Rabenh. Flor. Europ. Alg. ii. 47; W. et G. S. West, *l.c.*

GOLUNGO ALTO.—Cum *G. punctata*, ad saxa mollia juxta cataractam riv. Coango prope Sange: Sept. 1856. No. 134. Eodem loc. prope Mata do Velho Castro: Sept. 1856. No. 278.

### 5. CHROOCOCCUS Näg. (1849).

1. *C. minutus* Näg. Gatt. einz. Alg. 46 (1849); W. et G. S. West, *l.c.*

*Protococcus minutus* Kütz. Phyc. Gener. 168 (1843).

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15.

2. *C. turgidus* Näg., *l.c.* (1849); W. et G. S. West, *l.c.*

*Protococcus turgidulus* Kütz. Tab. Phyc. i. (1845-9), 5, t. 6.

HUILLA.—In paludibus exsiccandis: April 1860. No. 176.

3. *C. pallidus* Näg., *l.c.*, t. i. a, fig. 2 (1849); W. et G. S. West, *l.c.*

HUILLA.—In uliginosis editioribus prope Humpata, Empalanca et Lopollo: May 1860. No. 15.

4. *C. schizodermaticus* West in Journ. R. M. S. Dec. 1892, 742, t. x. fig. 61-63; in Journ. Linn. Soc. xxx. 275, t. xvi. f. 19 (1894).

Var. *badio-purpureus* W. et G. S. West in Journ. Bot. 1897, p. 302.

GOLUNGO ALTO.—Inter *Scytonema insigne*, ad rupes madidas in umbrosis juxta rivum Coango inter Sange et Undelle: May 1856. No. 5. Ad rupes juxta riv. Coango (N-della), crustam viscoso-cartilagineam fusco-badiam formans, *Collematis* thallum fingens; June 1856. Nos. 139 and 140.

Welwitsch contributed to the Journal of Travel and Natural History, vol. i. pp. 22-36 (1868), a paper entitled "The Pedras Negras of Pungo Andongo in Angola," in which he shows that the prolific growth of a subaërial alga is the cause of one of the main features of the country, as it gives such a peculiar aspect to the mountains that they are known as the "black rocks." He writes that it is "probably a non-described species of the prolific genus *Scytonema*, which in that situation during the rainy season generates and multiplies so rapidly that the upper portions of the

mountains are covered with it in a very short time. . . . Soon after the hot season has set in, at the end of May, when the horizon above the Praesidium is generally clear and bright, the black plantlets begin to discolour with the intense heat. They gradually become dry and brittle until they peel off altogether by-and-by, after which the rocks lose their sombre black aspect, and reappear in their natural grey or grey-brownish colour before the succeeding spring." Welwitsch named this plant *Scytonema chorographicum*, and gave a figure which is hardly characteristic. We have described it as *Scytonema Myochrous* var. *chorographicum* (Journ. Bot. 1897, p. 265); see *ante*, p. 371. Mixed with it is a quantity of *Dichothrix gypsophila*. He states that "the wonderful growth of *Scytonema* in such immense quantities is not confined to the mountain ridge of the Praesidium. . . . In proof of this fact, I may refer to the damp sandy upper valley of the Cuanza River, where a species of *Scytonema* is abundant, frequently extending across the wide meadows, closely spread like a net over the soil, intergrown with the other herbs and smaller shrubs. Through its hygroscopic nature it eagerly absorbs the atmospheric moisture during the dewy nights, affording by this means a refreshing protection to the roots of many other and larger plants during the glowing heat of the following day. The growth and thriving of the numerous small phanerogamous plants in these places is conditional on the co-presence of the prolific *Scytonema*." This second "*Scytonema*" alluded to by Welwitsch is *Porphyrosiphon Notarisii*, one of the *Vaginariae*; see *ante*, p. 375.

A parallel to this phenomenon is found on the sandy heaths of the south and some parts of the north of England. At the drier and hotter periods of the year, thickly-matted sheets of *Zygnum ericetorum* are to be found extending over wide patches of almost bare sand, round such plants as *Drosera*, *Carices*, etc. These interlacing masses have great absorptive capacity, greedily taking up water; it is also highly probable that they protect and render the growth of other plants more possible by regulating the moisture of the surface soil. It is interesting to note that *Zygnum ericetorum* is found intermixed in small quantity with the *Porphyrosiphon Notarisii* which covers such extensive areas in Angola. (Ex Journ. Bot. 1897, pp. 303, 304.)

# DIATOMACEÆ.

DETERMINED BY THOMAS COMBER.

1. **N. NAVICULA** Bory in Dict. Class. D'Hist. Nat. xi. p. 472 (1827); Cleve Syn. Navic. Diat. I., II. in K. Sv. Vet. Ak. Handl. xxvi., xxvii. (1894-95).

1. **N. cuspidata** Kuetz. Bacillar. p. 94. t. iii. f. 24, 37 (1844); Cleve, *op. cit.*, I. p. 109 (1894).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

Var. **ambigua** Cleve, *op. cit.*, I. p. 110 (1894).

*Navicula ambigua* Ehrenb. Verbreit. in Berlin, Abhand. K. Pr. Ak. 1843, t. II. ii. f. 9.

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Mûio ; 5 Feb. 1855. No. 147.

2. **N. Perrotettii** Cleve, *op. cit.*, I. p. 110. t. III. f. 12 (1894).

*Craticula Perrotettii* Grun. in Reise Novara. Bot. I. Alga. p. 20. t. I. f. 21 (1867).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Mûio : 5 Feb. 1855. No. 147.

3. **N. atomoides** Grun. in V. Heurck Syn. t. xiv. f. 12-14 (1880).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

4. **N. Rotæana** V. Heurck Syn. t. xiv. f. 17-19 (1880); Cleve, *op. cit.*, I. 128 (1894).

*Stauroneis Rotæana* Rabenh. in Hedwigia I. p. 103. t. xiii. f. 7 (1856).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

5. **N. mutica** Kuetz. Bacillar. p. 93. t. iii. f. 32 (1844).

Var. **Goeppertiana** V. Heurck Syn. t. x. f. 18, 19 (1880), p. 95 (1885).

*Stauroneis Goeppertiana* Bleisch in Rabenh. Alg. Eur. No. 1183 (1861); Rabenh. Fl. Eur. Alg. p. 248 (1864).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

6. **N. Pupula** Kuetz. Bacillar. p. 93. t. xxx. f. 40 (1844).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Mûio : 5 Feb. 1855. No. 147.

7. **N. (Diadesmis) confervacea** Grun. in V. Heurek Syn. t. xiv. f. 36 (1880).

*Diadesmis confervacea* Kuetz. Bacillar. p. 109, t. xxx, f. 8 (1844).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda : March 1857. No. 130.

8. **N. (Diadesmis) gallica** V. Heurek Syn. p. 108 (1885).

*Diadesmis gallica* W. Smith in Ann. Mag. Nat. Hist. Ser. 2. xix. p. 11, t. ii. f. 16 (1857). *Mastogloia* (?) *(Diadesmis) gallica* Cleve, *op. cit.*, II. 150 (1895).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Müo : 5 Feb. 1855. No. 147.

9. **N. Crucicula** Doukin Brit. Diat. p. 44, t. vi, f. 14 (1871).

*Stauroneis Crucicula* W. Smith Br. Diat. I. p. 60, t. xix, f. 192 (1853).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

10. **N. gibbula** Cleve, *op. cit.*, I. p. 140, t. v, f. 17 (1891).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

11. **N. pelliculosa** Hilse in Rabenh. Alg. Eur. No. 1265 (1862); Rabenh. Fl. Eur. Alg. p. 187 (1868).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

12. **N. cryptocephala** Kuetz. Bacillar. p. 95, t. iii, f. 26 (1844).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

13. **N. veneta** Kuetz. Bacillar. p. 95, t. xxx, f. 76 (1844).

Var. **pumila** Grun. in V. Heurek Syn. p. 5, t. viii, f. 7, t. xiv, f. 35 (1880-84) (*N. (veneta* var. *?) pumila*).

*N. cryptocephala* Kuetz. var. *pumila* Cleve, *op. cit.*, II. p. 14 (1895).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

14. **N. rhynchocephala** Kuetz. Bacillar. t. xxx, f. 35 (1844).

Var. **amphiceros** Cleve, *op. cit.*, II. p. 15 (1895).

*N. amphiceros* Kuetz. Bacillar. p. 95, t. iii, f. 39 (1844).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

15. **N. slesvicensis** Grun. in V. Heurek Syn. t. vii, f. 28, 29 (1880).

*N. viridula* Kuetz. var. *slesvicensis* Grun. in V. Heurek Syn. p. 81 (1885).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

16. **N. humilis** Doukin Brit. Diat. p. 67, t. x, f. 7 (1873).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

17. **N. cincta** Kuetz. *op. cit.* t. vii, f. 13, 14 (1880). p. 82 (1885).

*Pinnularia cincta* Ehrenb. Microgol. t. x, ii, f. 6 (1851).

GOLUNGO ALTO.—Rio Müo : 5 Feb. 1855. No. 147.

18. **N. radiosa** Kuetz. Bacillar. p. 91. t. iv. f. 23 (1844).  
GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

19. **N. oblonga** Kuetz. Bacillar. p. 97. t. iv. f. 21 (1844).  
*Frustulia oblonga* Kuetz. Alg. Dec. No. 71 (1833).  
GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

20. **N. dicephala** W. Smith Br. Diat. I. p. 87. t. xvii. f. 157 (1853).  
*Pinnularia dicephala* Ehrenb. in Berlin, Ber. K. Pr. Ak. 1837. p. 45; Infusionsth. p. 185 (1838).  
GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

21. **N. lanceolata** Ehrenb. Infusionsth. p. 185 (1838).  
*Frustulia lanceolata* Ag. in Flora x. p. 626 (1827).  
GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

22. **N. anglica** Ralfs in Pritchard Infusoria p. 900 (1861).  
*N. tumida* W. Smith Br. Diat. I. p. 53. t. xvii. f. 146 (1853).  
GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146. Rio Mûio ; 5 Feb. 1855. No. 147.

23. **Navicula (Schizonema) mollis** Cleve Syn. Navic. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 3. p. 26 (1895).  
*Schizonema molle* W. Smith Brit. Diat. II. p. 77. t. lviii. f. 365 (1856).  
LOANDA.—In company with minute plants of *Enteromorpha* on the apices of leaves of *Zostera marina* in the Atlantic Ocean, Praia (shore) de Zamba grande, near Loanda : 3 July 1858. No. 196.  
Welwitsch's specimen probably belongs to this species.

2. **CALONEIS** Cleve Syn. Navic. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 3. p. 46 (1895).

1. **C. fasciata** Cleve, *l.c.*, p. 50 (1895).  
*Navicula fasciata* Lagerst. Sötv. Diat. Spetsb. in Bih. K. Sv. Vet. Ak. Handl. I. 14. p. 34. t. ii. f. 11 (1873).  
GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Mûio : 5 Feb. 1855. No. 147.

2. **C. Silicula** Cleve, *l.c.*, p. 51.  
*Navicula Silicula* Ehrenb. Verbreit. in Berlin, Abhand. K. Pr. Ak. 1843, p. 419 (131).  
Var. **ventricosa** Cleve, *l.c.*, p. 52.  
*Navicula ventricosa* Ehrenb. in Berlin, Abhandl. K. Pr. Ak. 1830. p. 67.  
GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146.

3. **C. amphisbæna** Cleve, *l.c.*, p. 58.  
*Navicula amphisbæna* Bory in Eneyel. Méthod. Zoophytes p. 565 (1824).  
GOLUNGO ALTO. On small shells in ponds near Sange ; Dec. 1854. No. 146.

3. **NEIDIUM** Pfitzer Bau u. Entw. d. Bacillar. in Hanstein Bot. Abhandl. Bonn, I. ii. p. 39 (1871); Cleve Syn. Navie. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2, p. 67 (1894).

1. **N. affine** Cleve, *loc. cit.*, p. 68 (1894).

*Narienla affinis* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843, p. 417 (129), t. II, ii, f. 17, etc.

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

4. **ANOMONEIS** Pfitzer Bau u. Entw. d. Bacillar. in Hanstein Bot. Abhandl. Bonn, I. ii. p. 77 (1871); Cleve Syn. Navie. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 3, p. 5 (1895).

1. **A. sphærophora** Pfitz., *loc. cit.*, p. 77, t. iii, f. 10 (1871).

*Narienla sphærophora* Kuetz. Bacillar. p. 95, t. iv, f. 17 (1844).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Müio ; 5 Feb. 1855. No. 147.

2. **A. sculpta** Cleve, *op. cit.*, II, p. 6 (1895).

*Narienla sculpta* Ehrenb. Mierogeol. t. x, i, f. 5 (1854).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

5. **DIPLONEIS** Ehrenb. in Berlin, Ber. K. Pr. Akad. 1844, p. 84; Cleve Syn. Navie. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2, p. 76 (1894).

1. **D. elliptica** Cleve, *op. cit.*, p. 92 (1894).

*Narienla elliptica* Kuetz. Bacillar. p. 98, t. xxx, f. 55 (1844).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

2. **D. ovalis** Cleve, *op. cit.*, p. 92 (1894).

*Pinularia ovalis* Hilse in Breslau, Schles. Ges. Vaterl. Kultur. 1860, p. 82.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* var. *obcordata* Engl. (cf. Welw. Herb. No. 215) at the sides of the river Cuige near Quibinda : March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146.

6. **STAURONEIS** Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843, p. 422 (134); Cleve Syn. Navie. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2, p. 142 (1894).

1. **S. Crueicula** Cleve, *loc. cit.*, p. 151 (1894).

*Schizostauron Crueicula* Grun. ex Cleve in K. Sv. Vet. Ak. Handl. xviii. 5, p. 16, t. iii, f. 44 (1881).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147.

7. **PINNULARIA** Ehrenb. in Berlin, Ber. K. Pr. Akad. 1840 p. 213; Cleve Syn. Navie. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 3, p. 71 (1895).

1. **P. subcapitata** Greg. in Quart. Journ. Mier. Sci. iv, p. 9, t. I, f. 30 (1856).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147

2. **P. microstauron** Cleve, *op. cit.*, II. p. 77 (1895).

*Stauroptera microstauron* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. p. 423. t. I. iv. f. 1.

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146.

3. **P. Legumen** Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. p. 384. t. IV. i. f. 7 ; Cleve, *op. cit.*, II. p. 78 (1895).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

4. **P. borealis** Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. t. I. ii. f. 6 ; Cleve, *op. cit.*, II. p. 80 (1895).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

5. **P. gibba** W. Smith Brit. Diat. I. t. xix. f. 180 (1853) ; Cleve, *op. cit.*, II. p. 82 (1895).

*Stauroptera gibba* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. t. I. ii. f. 3.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda ; March 1857. No. 130.

6. **P. paulensis** Grunow ex Cleve, *op. cit.*, II. p. 86. t. I. f. 20 (1895).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146. Rio Mûio ; 5 Feb. 1855. No. 147.

7. **P. Dactylus** Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. p. 420 (132). t. IV. i. f. 3 ; Cleve, *op. cit.*, II. p. 90 (1895).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146.

8. **GYROSIGMA** Hassall Brit. Freshwater Algae p. 435 (1845) ; Cleve Syn. Navic. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2. p. 112 (1894).

1. **G. acuminatum** Cleve, *loc. cit.*, p. 114 (1894).

*Frustulia acuminata* Kuetz. Syn. Diat. in Linnaea viii. p. 555, t. xiv. f. 36 (1833).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

2. **G. Kuetzingii** Cleve, *loc. cit.*, p. 115 (1894).

*Pleurosigma Kuetzingii* Grun. in Wien, Verh. k. k. zool. bot. Ges. x. p. 561. t. vi (4). f. 3 (1860).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146. Rio Mûio ; 5 Feb. 1855. No. 147.

9. **GOMPHONEMA** Ag. Syst. Alg. p. 11 (1824) ; Cleve Syn. Navic. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2. p. 178 (1894).

1. **G. parvulum** V. Heurek Syn. t. xxv. f. 9 (1880), p. 125 (1885).

*Sphenella ? parcula* Kuetz. Bacillar. p. 83. t. xxx. f. 63 (1844).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146.

2. **G. Lagenula** Kuetz. Bacillar. p. 85. t. xxx. f. 60 (1844) ; V. Heurck Syn. t. xxv. f. 7, 8 (1880).

GOLUNGO ALTO.—In company with the variety figured in V. Henrek's Synops. t. xxv. f. 7; Rio Múio; 5 Feb. 1855. No. 147. A rather broad form: on small shells in ponds near Sange: Dec. 1854. No. 146.

Var. *lata* Comber, var. nov.

Much broader and shorter than the typical form, and so nearly symmetrical that it might at first sight be mistaken for a *Nori culata*. Many may regard it as a distinct species: in which case it might be named **G. Welwitschii** Comber.

LIBONGO.—Very plentiful, in company with *Wolffia*, in an unfinished shaft of a coal mine above Banza de Libongo: Sept. 1858. No. 137.

3. **G. intricatum** Kuetz. Bacillar. p. 87. t. ix. f. 4 (1844).

Var. *pumila* Grun. in V. Henrek Syn. t. xxiv. f. 35, 36 (1880).

GOLUNGO ALTO.—Rio Múio; 5 Feb. 1855. No. 147.

4. **G. dichotomum** Kuetz. Syn. in Linnaea viii. p. 569. t. xv. f. 48 (1833).

GOLUNGO ALTO.—On small shells in ponds near Sange: Dec. 1854. No. 146.

5. **G. Vibrio** Ehrenb. Verbreit. in Berlin. Abhandl. K. Pr. Ak. 1843. p. 416 (128). t. II. i. f. 40.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

6. **G. gracile** Ehrenb. Infusionsth. p. 217. t. xviii. f. 3 (1838).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange: Dec. 1854. No. 146.

Var. *naviculoides* Grun. in V. Henrek Syn. t. xxiv. f. 13 (1880).

*Gomphonema naviculoides* W. Sm. Brit. Diat. II. p. 98 (1856). *G. gracile* var. *naviculaceum* Cleve, loc. cit., I. p. 183 (1894).

GOLUNGO ALTO.—On small shells in ponds near Sange: Dec. 1854. No. 146.

7. **G. commutatum** Grun. in V. Henrek Syn. t. xxiv. f. 2 (1880).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

8. **G. oxycephalum** Cleve, loc. cit., I. p. 187. t. v. f. 10 (1894).

GOLUNGO ALTO.—Rio Múio; 5 Feb. 1855. No. 147.

9. **G. olivaceum** Kuetz. Bacillar. p. 85. t. vii. f. 13, 14 (1844).

*Echinella olivacea* Lyngb. Tent. Hydr. Dan. p. 209. t. 70. f. C, 1-3.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange: Dec. 1854. No. 146.

10. **G. tenellum** Kuetz. Bacillar. p. 84. t. viii. f. 8, b (1844).

*G. olivaceum* var. *tenellum* Cleve, loc. cit., I. p. 188 (1894).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

10. **CYMBELLA** Ag. Conspect. Crit. Diatom. p. 1 (1830); Cleve Syn. Navic. Diat. I. in K. Sv. Vet. Ak. Handl. xxvi. 2. p. 156 (1894).

1. **C. laevis** Naeg. ex Kuetz. Sp. Alg. p. 58 (1849); V. Heurek Syn. t. iii. f. 7 (1880). p. 62 (1885).

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

2. **C. stauroneiformis** Lagerst. Sötv. Diat. Spetsb. in Bih. K. Sv. Vet. Ak. I. 14. p. 45. t. I. f. 15 (1873).

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

3. **C. laeustris** Cleve, *loc. cit.*, p. 167 (1894).

*Schizonema lacustre* Ag. Syst. Alg. p. 10 (1824). *Encyonema Ungerii* Grun. ex A. Schmidt Atlas t. x. f. 63 (1875).

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

4. **C. prostrata** Cleve, *l.c.*, p. 167 (1894).

*Monema prostratum* Berk. Glean. Br. Alg. p. 15. t. iv. f. 3 (1833). *Encyonema prostratum* Ralfs in Ann. Mag. Nat. Hist. xvi. p. 111. t. iii. f. 3 (1845).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

5. **C. turgida** Greg. in Quart. Journ. Mier. Sci. iv. p. 5. t. I. f. 18 (1856). *Encyonema turgidum* Grun. ex A. Schmidt Atlas t. x. f. 49–53 (1875).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

6. **C. ventricosa** Ag. Conspect. Crit. Diat. I. p. 9 (1830)?; Kuetz. Bacillar. p. 80. t. vi. f. 16 (1865).

*Encyonema ventricosum* V. Heurek Syn. t. iii. f. 15 17, 19 (1880), p. 66 (1885).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

7. **C. turgidula** Grun. ex A. Schmidt Atlas t. ix. f. 23–26 (1875).

Var. *inæqualis* Comber, var. nov.

One end is more produced than the other, so that the valve is sub-claviform.

GOLUNGO ALTO.—On small shells in ponds near Sange; Dec. 1854. No. 146. Rio Mûio; 5 Feb. 1855. No. 147.

11. **AMPHORA** Ehrenb. in Berlin, Ber. K. Pr. Ak. 1840. p. 205; Cleve Syn. Navic. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 2. p. 99 (1895).

1. **A. ovalis** Kuetz. Bacillar. p. 107 (1865).

*Frustulia ovalis* Kuetz. Synops. in Linnaea viii. p. 539 (1833).

Var. *libyca* Cleve, *loc. cit.*, II. p. 104 (1895).

*Amphora libyca* Ehrenb., *l.c.*, p. 205 (1840).

GOLUNGO ALTO.—On small shells in ponds near Sange; Dec. 1854. No. 146. Rio Mûio; 5 Feb. 1855. No. 147.

Var. **Pediculus** V. Heurek Syn. p. 59 (1885).

*Cymbella* ? *Pediculus* Kuetz. Bacillar. p. 80 (1865).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Múio ; 5 Feb. 1855. No. 147.

2. **A. quadricostata** Rabenh. Süssw. Diatom. t. ix. f. 5 (1853).

*A. veneta* Cleve, loc. cit., II. p. 118 (1895).

BARRA DO BENGÓ.—On *Naia* in Lagoa Quifandongo, near Quise quela ; Nov. 1853. No. 135.

12. **COCCONEIS** Ehrenb. Infusionsthierchen, p. 193 (1838) ; Cleve Syn. Navie. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 2. p. 168 (1895).

1. **C. Placentula** Ehrenb., loc., p. 194 (1838).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854 No. 146. Rio Múio ; 5 Feb. 1855. No. 147.

13. **ACHNANTHIDIUM** Kuetz. Bacillar. p. 75 (1844) ; Heiberg Consp. crit. Diat. Danie. p. 118 (1863) ; Cleve Syn. Navie. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 2. pp. 164, 191 (1895) (subgenus).

1. **A. lanceolatum** Bréb. ex Kuetz. Sp. Alg. p. 51. 1849.

Var. **Haynaldii**.

*Achnanthes Haynaldii* Schaarschm. Sp. Phyc. Aequat. in Kanitz Magy. Növénytani Lapok. v. p. 20 (1881). *A. lanceolata* var. *Haynaldii* Cleve in Diatomiste II. p. 99. t. vii. f. 14 (1891).

GOLUNGO ALTO.—Rio Múio ; 5 Feb. 1855. No. 147.

2. **A. delicatulum** Kuetz. Bacillar. p. 75. t. iii. f. 21 (1844).

GOLUNGO ALTO. Rio Múio ; 5 Feb. 1855. No. 147.

3. **A. Hauckii**.

*Achnanthes Hauckiana* Grun. in Cleve et Grun. Aret. Diat. in K. Sv. Vet. Ak. Handl. xvii. 2. p. 21 (1880). *A. Hauckii* Grun. in V. Heurek Syn. t. xxvii. f. 14, 15 (1880).

GOLUNGO ALTO.—Rio Múio ; 5 Feb. 1855. No. 147.

14. **MICRONEIS** Cleve Syn. Navie. Diat. II. in K. Sv. Vet. Ak. Handl. xxvii. 2. pp. 164, 187 (1895) (subgenus).

1. **M. exigua**.

*Achnanthes exigua* Grun. in Cleve et Grun. Aret. Diat. in K. Sv. Vet. Ak. Handl. xvii. 2. p. 21 (1880).

GOLUNGO ALTO.—Rio Múio ; 5 Feb. 1855. No. 147.

15. **NITZSCHIA** Hassall Brit. Freshwater Algae p. 135 (1845) ; Grun. in Cleve et Grun. Aret. Diat. in K. Sv. Vet. Ak. Handl. xvii. 2. p. 67 (1880).

1. **N. Tryblionella** Hantzsch in Rabenh. Alg. Eur. No. 981 (1860) ; Cleve et Grun. Aret. Diat. in K. Sv. Vet. Ak. Handl. xvii. 2. p. 69 (1880).

*Tryblionella Hantzschiana* Grun. in Wien. Verh. k. k. zool. bot. Ges. xii. p. 552. t. xviii (12). f. 29 (1862).

Var. **Victoriæ** Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 69 (1880).

*Tryblionella Victoriae* Grun. in Wien, Verh. k. k. zool. bot. Ges. xii. p. 553. t. xviii (12). f. 34 (1862).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

Var. **calida** V. Heurek Syn. p. 171 (1885).

*N. calida* Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 75 (1880); V. Heurek Syn. t. lix. f. 4, 5 (1882).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

2. **N. perversa** Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 70 (1880).

BARRA DO BENGÓ.—On *Naias* in Lagoa Quifandongo, near Quisequele ; Nov. 1853. No. 135.

3. **N. hungarica** Grun. in Wien, Verh. k. k. zool. bot. Ges. xii. p. 568. t. xviii (12). f. 31 (1862).

BARRA DO BENGÓ.—On *Naias* in Lagoa Quifandongo, near Quisequele ; Nov. 1853. No. 135.

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

4. **N. dubia** W. Smith Brit. Diat. I. p. 41 (1853).

BARRA DO BENGÓ.—On *Naias* in Lagoa Quifandongo, near Quisequele ; Nov. 1853. No. 135.

5. **N. Petitiana** Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 104 in adnot. (1880).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

6. **N. dissipata** Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 90 (1880).

*Synedra dissipata* Kuetz. Bacillar. p. 64. t. xiv. f. 3 (1844).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

7. **N. vermicularis** Hantzsch in Rabenh. Alg. No. 889 (1859) ; Pritchard Infus. p. 781 (1861).

*Synedra vermicularis* Kuetz. Bacillar. p. 67. t. iv. fig. 35 (1844).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

8. **N. linearis** W. Smith Br. Diat. I. p. 39. t. xiii. f. 110 (1853).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146. Rio Mûio ; 5 Feb. 1855. No. 147

9. **N. Palea** W. Smith Br. Diat. II. p. 89 (1856).

*Synedra Palea* Kuetz. Bacillar. p. 63. t. iii. 27, iv. 3 (1844).

LIBONGO.—Rare, in company with *Wolfia*, in an uncompleted shaft of a coal mine above Banza de Libongo ; Sept. 1858. No. 137.

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

Var. **debilis** Grun. in Cleve et Grun. Aret. Diat., *l.c.*, p. 96 (1880).

*Synedra debilis* Kuetz. Bacillar. p. 65. t. iii. f. 45 (1844).

BARRA DO BENGÓ.—On *Naias* in Lagoa Quifandongo, near Quisequele ; Nov. 1853. No. 135.

10. **N. communis** Rabenh. Alg. n. 949 (1859); Grunow in Wien, Verh. k. k. zool. bot. Ges. xii. p. 578, t. xviii (12), f. 18 (1862).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854 No. 146.

11. **N. amphibia** Grun. in Wien, Verh. k. k. zool. bot. Ges. xii. p. 574, t. xviii (12), f. 23 (1862).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854 No. 146.

12. **N. Frustulum** Grun. in Cleve et Grun. Aret. Diat., Lc., p. 98 (1880).

*Synechia Frustulum* Kuetz. Bacillar. p. 63, t. xxx, f. 77 (1811).

Var. **Hantzschiana**.

*N. Hantzschiana* Rabenh. in Hedwig, II, p. 40, t. vi, f. 6 (1860).

*N. (Frustulum) var. Hantzschiana* V. Heurek. Syn. Atlas p. 72, t. 69, f. 1, 2 (1880-84).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

16. **HANTZSCHIA** Grun. in Cleve et Grun. Aret. Diat. in K. Sv. Vet. Ak. Handl. xvii. 2, p. 103 (1880).

1. **H. amphioxys** Grun., Lc., p. 103 (1880).

*Eunotia amphioxys* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843, p. 413 (125), t. 1, i. f. 26.

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

17. **SURIRELLA** Turpin in Paris, Mém. Mus. Hist. Nat. xvi. p. 361 (1828). *Suriraya* Pfitzer Bau u. Entw. Bacillar. in Haist, Bot. Abhandl. I. p. 107 (1871).

1. **S. biseriata** Bréb. Alg. Env. Falaise p. 53, t. vii. (1835).

GOLUNGO ALTO. A small form with scattered apiculi ; on small shells in ponds near Sange : Dec. 1854. No. 146. Oval form with scattered apicula : Rio Mûio : 5 Feb. 1855. No. 147.

2. **S. splendida** Kuetz. Bacill. p. 62, t. vii, f. 9 (1814).

*Naricula splendida* Ehrenb. in Berlin, Abhandl. K. Pr. Ak. 1831, p. 81 ; Infusionsth. p. 186, t. xiv, f. 1 (1838).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Mûio : 5 Feb. 1855. No. 147.

3. **S. tenera** Greg. in Quart. Journ. Mier. Sci. iv. p. 11, t. 1, f. 38 (1856).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854 No. 146.

1. **S. constricta** Ehrenb. Microgeol. t. xiv, f. 37 (1854).

*Naricula constricta* Ehrenb. Infusionsth. p. 188, t. xxi, f. 17 (1838).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

Var. **areta**.

*S. areta* A. Schm. Atlas t. xxiii, f. 23-25 (1875).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

5. **S. augusta** Kuetz. Bacillar. p. 61. t. xxx. f. 52 (1844).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147.

Var. **apiculata** Grun. in Wien, Verh. k. k. zool. bot. Ges. xii. p. 455. t. vii. (10). f. 8 (1862).

*S. apiculata* W. Smith Br. Diat. II. p. 88 (1856).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147.

6. **S. Moelleriana** Grun. in Moeller, Typen Platten 2-3-4 (Date ?) ; A. Schmidt Atlas t. xxiii. f. 36, etc. (1875).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147.

18. **CYMATOPLEURA** W. Smith in Ann. Mag. Nat. Hist. Ser. 2. vii. p. 12 (1851).

1. **C. Solea** W. Smith, l.c., p. 12. t. iii. f. 9 (1851).

*Surirella Solea* Kuetz. Bacillar. p. 60. t. iii. f. 61 (1844).

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. Rio Müio, 5 Feb. 1855. No. 147.

19. **DIATOMA** DC. Flor. Franç. II. p. 48 (1805) ; Heib. Consp. Crit. Diat. Danie. p. 55 (1863).

1. **D. elongatum** Ag. Syst. Alg. p. 4 (1824).

Var. **Ehrenbergii** V. Heurck Syn. p. 160 (1885).

*Diatoma Ehrenbergii* Kuetz. Bacill. p. 48. t. xvii. f. 18 (1844).

*D. grande* W. Smith Br. Diat. II. p. 39. t. xl. f. 310 (1856).

BARRA DO BENGÓ.—On *Naïas* in Lagoa Quifandongo, near Quisequele ; Nov. 1853. No. 135.

20. **SYNEDRA** Ehrenb. in Berlin, Abhand. 1830. p. 40 ; Infusionsth. p. 210 (1838) ; Kirchn. in Cohn Krypt.-Flor. Schles. II. i. p. 207 (1878).

1. **S. Ulna** Ehrenb. Infusionsth. p. 211. t. xvii. f. 1 (1838).

*Bacillaria Ulna* Nitzsch Beitr. z. Infus. p. 99. t. v., in Halle, Neue Schrift. Naturf. Ges. III. i. (1817).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda ; March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange : Dec. 1854. No. 146. In company with a short broad form in which the blank is often unilateral, and also with a constricted form ; Rio Müio, 5 Feb. 1855. No. 147.

2. **S. splendens** Kuetz. Bacillar. p. 66. t. xiv. f. 16 (1844) ; V. Heurck. Syn. t. xxxviii. f. 2 (1880-84).

GOLUNGO ALTO.—On small shells in ponds near Sange ; Dec. 1854. No. 146. Rio Müio ; 5 Feb. 1855. No. 147.

3. **S. Acus** Kuetz. Bacillar. p. 68. t. xv. f. 7 (1844).

Var. **delicatissima** Grun. in V. Heurck Syn. p. 151 (1885).

*S. delicatissima* W. Smith Br. Diat. I. p. 72. t. xii. f. 94 (1853).

GOLUNGO ALTO.—Rio Müio ; 5 Feb. 1855. No. 147.

4. **S. affinis** Kuetz. Bacillar. p. 68. t. xv. f. 6, etc. (1844).

GOLUNGO ALTO.—The freshwater form *S. putalis* O'Meara Rep. I. Diat. in Dublin, Proc. R. Ir. Acad. Sci. Ser. 2. II. p. 312, t. xxviii. f. 4 (1876); Rio Mûio; 5 Feb. 1855. No. 147.

21. **EPITHEMIA** Kuetz. Bacillar. p. 33 (1814). *Epithemia* Bréb. Consid. s. l. Diat. p. 16 (1838).

1. **E. gibba** Kuetz. Bacillar. p. 35, t. iv, f. 22 (1814).

*Naricula gibba* Ehrenb. in Berlin, Abhandl. K. Pr. Ak. 1850 p. 68; Infusionsth. p. 181, t. xiii, f. 19 (1838).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange; Dec. 1854 No. 146. Rio Mûio; 5 Feb. 1855. No. 147.

Var. **ventricosa** Grun. in V. Heurek Syn. t. xxxii, f. 1, 5 (1880); p. 139 (1885).

*E. ventricosa* Kuetz. Bacillar. p. 35, t. xxx, f. 9 (1814).

GOLUNGO ALTO.—On small shells in ponds near Sange; Dec. 1854 No. 146. Rio Mûio; 5 Feb. 1855. No. 147.

Var. **parallela** Grun. in V. Heurek Syn. t. xxxii, f. 3 (1880); p. 139 (1885).

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

Var. **ovalis** Comber, var. nov.

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

Var. **clavata** Comber, var. nov.

*E. clavata* J. L. B. MS. in Coll. Roy. Mier. Soc. No. 951.

GOLUNGO ALTO.—Rio Mûio; 5 Feb. 1855. No. 147.

2. **E. gibberula** Kuetz. Bacillar. p. 35, t. xxix, f. 54, t. xxx, f. 6 (1814).

*Eunotia gibberula* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843, p. 414 (126), t. III, iv, f. 8.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

GOLUNGO ALTO.—On small shells in ponds near Sange; Dec. 1854 No. 146. Rio Mûio; 5 Feb. 1855. No. 147.

22. **EUNOTIA** Ehrenb. in Berlin, Ber. K. Pr. Ak. Wissenschaft. II. 41 (1837); Grun. in Wien, Verh. k. k. zool. bot. Ges. xii, p. 331 (1862).

1. **E. Arcus** Ehrenb. in Berlin, Ber. K. Pr. Ak. 1837, p. 15; Infusionsth. p. 191, t. xxi, f. 22 (1838).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

2. **E. major** Rubenb. Fl. Eur. Alg. I. p. 72 (*majus*) (1861).

*Himantidium majus* W. Smith Br. Diat. II. p. 14, t. xxxiii, f. 286 (1856).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda; March 1857. No. 130.

BARRA DO BENGÓ.—On *Natia* in Lagoa Quifandongo, near Quisequele; Nov. 1853. No. 135.

3. **E. pectinalis** Rabenh. Fl. Eur. Alg. I. p. 73 (1864).

*Conferva pectinalis* Dillw. Brit. Conferv. t. 24 (1809).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda : March 1857. No. 130.

4. **E. minor** V. Heurck Syn. Atlas p. 36. t. xxxiii. f. 20, 21 (1880).

*Himantidium minus* Kuetz. Bacillar. p. 39. t. xvi. f. 10 (1844).

GOLUNGO ALTO.—Rio Mûio ; 5 Feb. 1855. No. 147.

5. **E. Eulensteini** Comber, sp. n.

*Diatoma Eulensteini* Welw. in sched.

It may possibly be identical with *Desmogonium guianense* Ehrenb. [in Schomb. Reisen in Brit. Guian. III. p. 539 (1848)], but it has not the distinctive character upon which that genus was founded.

I find no *Diatoma* in the material ; and, as this species is the most characteristic form present, I take it to be what is meant. There are two forms :—

*f. biconstricta*, with a central inflation.

*f. constricta*, without a central inflation.

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda : March 1857. No. 130.

23. **TABELLARIA** Ehrenb. in Berlin, Ber. K. Pr. Ak. 1840. p. 217.

1. **T. flocculosa** Kuetz. Bacillar. p. 127. t. xvii. f. 21 (1844).

*Conferva flocculosa* Roth. Catalect. Botan. I. p. 192. t. iv. f. 4, v. f. 6 (1797).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

24. **CERATAULUS** Ehrenb. in Berlin, Ber. K. Pr. Akad. 1843. p. 270 ; Ralfs in Pritch. Infus. p. 846 (1861).

1. **C. laevis** Ralfs in *op. cit.*, p. 847 (1861).

*Biddulphia laevis* Ehrenb. Verbreit. in Berlin, Abhandl. K. Pr. Ak. 1843. p. 410 (122).

GOLUNGO ALTO.—Rio Mûio : 5 Feb. 1855. No. 147.

25. **MELOSEIRA** Ag. Syst. Alg. pp. xiv. 8 (1824) ; Kuetz. Bacillar. p. 52 (1844) (*Melosira*).

1. **M. varians** Ag. in Flora x. p. 628 (1827) ; Conspl. Crit. Diat. p. 64 (1832).

PUNGO ANDONGO.—On roots of *Pistia Stratiotes* in the Cuige river near Quibinda : March 1857. No. 130.

The following numbers represent material which is insufficient for examination, or in which no Diatoms have been detected :—

HUILLA.—No notes. However, the presence of *Eriocaulon huillense* suggests that the gathering came from elevated swamps near Humpata. etc., and should be compared with Alga No. 15. No. 16.

LIBONGO.—In company with *Wolffia* in a disused petroleum mine, full of pure water, above Banza de Libongo : Sept. 1858. No. 129.

LOANDA.—Among *Oscillaria* in wooden buckets partially or not continually filled with water in gardens at Loanda; in the country garden of Sr. Dr. Mendes Alfonso; 18 Oct. 1858. No. 127. Sediment of *Lemna* and *Chara* from the Represa (pond) of Luis Gomez; Feb. 1858. No. 281. No specimen. Sediment of Infusoria; Represa de Bemposta; 17 June 1858. No. 283.

GOLUNGGO ALTO.—Yellowish-red slimy tufts, sometimes floating in bubbly masses on the surface of ponds, sometimes submerged in company with *Conferra*; remarkable for their metallic lustre in the dry state; only once observed, and then it was common in ponds in the banks of the Cuango river near Sange; in Isidro's Varzea (marshy meadow), July 1857. No. 133. With *Conferra* in rivulets near Sange; June 1856. No. 160.

BENGUELLA.—A green Alga, very gregarious, forming yellowish-green scum-like strata over several miles of the ocean about a mile from the coast. Welwitsch records that on the 22nd and 23rd of June 1860, the sea in the Bay of Bengnella was for several miles parallel to the coast covered with strata of this Alga; and he hazards the suggestion that it might perhaps have been carried down with the flood out of the river Catumbella. No. 184.

# LICHENES.

SCRIPSIT EDV. A. WAINIO.

## I. DISCOLICHENES.

### A. CYCLOCARPEAE.

#### TRIB. I.—PARMELIEÆ.

##### 1. USNEA (Dill.) Pers.

1. *U. barbata* (L.) Ach. \**U. florida* (L.) Wain. Etud. Lich. Brés. I. p. 3.

Var. *comosa* (Ach.) Wain., *l.c.*, p. 5.

HUILLA.—Sterilis ad trunco in summis montium Serra da Xella (3800 ad 5500 ped. s. m.). No. 21 pr. p.

Var. *mollis* (Stirt.) Wain.

LOANDA.—Ad trunco vetustos in sylva primitiva inter Calambe et ostia fluminis Cuanza. No. 68. Fert. Medulla laxa, KHO non reagens.

Var. *australis* (Fr.) Wain.

*U. australis* Fr., Syst. Orb. Veg. p. 282 (secund. specim. orig. in herb. Müll.). *U. barbata* v. *australis* Müll. Arg., Lich. Beitr. n. 1066.

PUNGO ANDONGO.—Prope Pedra de Cansambe (2400 ad 3800 ped. s. m.) frequenter ad omnes fere frutices, sed præprimis ad Velloiarum rupestrium ramulos frequentissima. No. 72. Fert. Medulla laxa. KHO lutescens.

Var. *subelegans* Wain., *l.c.*, p. 6.

HUILLA.—Ad ramulos arborum in summis montium Serra da Xella (3800 ad 5500 ped. s. m.). No. 21 pr. p. Fert.

2. *U. rigida* Wain., sp. n.

Thallus erectus, rigidus, longitudine circ. 50 ad 100 mm., ramis primariis circ. 0.9 ad 1.5 mm. crassis, ramis omnibus teretibus, glaucescens, verrucis minutissimis albidis subsorediosis creberrimis maxima parte instructus, basi laevigatus, soraliis distinctis destitutus, ramis adventitiis nullis aut sat numerosis circ. 1 ad 5 mm. longis. Stratum myelohypicum crebre contextum, KHO haud rubescens, jodo passim caerulecens. Ster. Comparabilis cum *U. cornuta* (Flot.) Stirt., Usn. 1881, p. 5 (Müll. Arg., Lich. Beitr. n. 1063, Steiner, Flecht. Brit. Ostafri., p. 213), at thallo neque distincte soredioso, nec passim nigricante, et verrucis minoribus ab ea differt.

PUNGO ANDONGO.—Frequenter ad rupes perpendiculares versus

austrum spectantes in praeruptis ad Calundo (2400 ad 3800 ped. s. m.)  
No. 71. *U. larris* (Eschw.) Nyl., in Benguella a Welwitsch lecta est,  
ut indicat Nyl., Prodr. Fl. Nov.-Granat. ed. 2, p. 299.

3. **U. arthroclada** Fée. \***U. arthrocladodes** Wain., subsp. n.

Thallus pendulus, denum elongatus, sat rigidus, glaucescens  
aut partim pallido-glauecens, ramis primariis cire, 1 ad 0.5 mm.  
crassis, ramulis 2 ad 30 mm. longis, vulgo cire, 2 ad 3 mm. distan-  
tibus, e dichotomia inaequali ortis instructus, cortice sat crebre  
articulato, maxima parte verruculosis cartilagineis thallo conceolori-  
bus, minutissimis (lente visibilibus) crebre ornatus, esorediatus.  
Stratum myelophyicum crebre contextum, KHO haud rengens.  
Apothecia numerosa, ramulis lateralibus affixa, cire, 5 ad 7 mm.  
lata, margine spinuloso, spinis 2 ad 10 mm. longis, disco cæsio-  
pruinoso, excipulo extus sat levigato aut leviter rugoso. Thallo  
crebre cartilagineo-verruculoso et reactione differt ab *U. arthro-  
clada* Fée (Wain., Etud. Lich. Brés. I, p. 10), que secundum  
specimen orig. in herb. Müll. thallo levigato et medulla KHO  
rubescente instrueta est (in specimine ad Petropolin ab Impera-  
trice Brasiliæ lecto thallus est levigatus aut passim parec  
in crebreque cartilagineo-verruculosus et medulla KHO aurantiaco  
rubescens).

GOLUNGO ALTO.—Ad arbores in montibus Serra de Alta Queta  
No. 69 pr. p.

4. **U. longissima** Ach.

Ad arbores secus flumen Quillu leg. Pechuel Loesche teste Müll.  
Arg., Lich. Afr. Occ. (Linnaea 1880), p. 31.

5. **U. angulata** Ach. \***U. goniodes** (Stirt.) Wain., Etud. Lich.  
Brés. I, p. 12.

LOANDA.—Ad ramulos arborum vetustarum prope ripas thuminis  
Cuanza fluxu maris visitatas et quondam obiectas. Nos. 67 et 73  
Etiam fert. test. Welwitsch.

GOLUNGO ALTO.—Ad arbores in montibus Serra de Alta Queta.  
No. 69. Ster.

Var. **flaccida** (Müll. Arg.) Wain.

*U. angulata* var. *flaccida* Müll. Arg., Lich. Afr. Trop. (1890),  
p. 337, secund. specim. orig. in herb. meo.

GOLUNGO ALTO.—Ad arbores in montibus Serra de Alta Queta  
No. 69 pr. p. Ster.

2. **RAMALINA** Ach.

1. **R. geniculata** Nyl., Mon. Rém. p. 65, pr. p.; Wain., Etud.  
Lich. Brés. I, p. 15.

GOLUNGO ALTO.—Ad ramulos languescentes in sylvis rarissimis  
Serra de Alta Queta. No. 88. Fert.

Var. **olivacea** Müll. Arg., Lich. Beitr. n. 128, prope Landana a  
Pechuel-Loesche lecta est.

2. **R. dendroscoides** Nyl. in Fl. 1876, p. 112.

GOLUNGO ALTO.—Ad ramos inferiores fere horizontales *Ulmaceo-  
turido* in sylvis densis Sobati Quilombo et Quicatubia. No. 84. Ster.

MOSSAMEDES IN BENGUELLA.—Frequentissime et cum *Roccella* socialis ad rupes calcareas in maritimis prope Saco de Giraúl, at parcissime fructifera teste Welw. No. 24.

3. **R. gracilis** (Pers.) Nyl.

*R. maculata* Müll. Arg., Lich. Beitr. n. 64, 127 (Lich. Schenck. p. 226).

AMBRIZ.—Ad ramulos Celastrinearum aliorumque fruticum in collinis maritimis prope Ambriz. No. 85 pr. p. 90. Fert. Prope Landana leg. Pechuel-Loesche (Müll. Arg., Lich. Beitr. n. 127).

4. **R. leptosperma** Nyl. in Fl. 1876, p. 412.

AMBRIZ.—Ad ramulos Celastrinearum aliorumque fruticum in collinis maritimis prope Ambriz una cum *R. gracilis*. No. 85 pr. p. Fert.

5. **R. Tingitana** Salzm. in Nyl. Mon. Ram. p. 62.

INS. CAPITIS VIRIDIS.—Ad rupes basalticas insulae S. Vincentii in editioribus montibus (Monte Verde). No. 87. Ster.

6. **R. Yemensis** (Ach.) Nyl., *l.c.*, p. 46; Wain., Etud. Lich. Brés. I. p. 20.

GOLUNGO ALTO.—Rarius ad ramulos emortuos arborum in sylvis raris edit. montium Serra de Alta Queta. No. 86. Fert.

7. **R. complanata** (Sw.) Ach. ; Wain., *l.c.*, p. 21.

BARRA DO BENGÓ (DANDE).—Ad ramulos subemortuos Celastrinearum aliorumque fruticum in Praia de S. Thiago ad Oceanum Atlanticum. No. 89. Fert.

*R. denticulata* (Eschw.) Nyl. e Landana (leg. Pechuel-Loesche) in Müll. Arg. Lich. Afr. Occ. (Linnaea 1880), p. 82, commemoratur.

8. **R. euphorbiæ** Wain., sp. n.

Thallus sat brevis, circ. 15 ad 35 mm. altus, suberectus, compressus, dichotome aut irregulariter laciniatus, laciniis sublinearibus aut irregularibus, patentibus, apice obtusis aut attenuatis, laciniis primariis circ. 10 ad 2 mm. latis, planis aut subcanaliculatis, crebre reticulato-nervosus, haud papillosus, esoreliatus, opacus, cæsio-glaucescens ; medulla KHO non reagens. Apothecia circ. 3 ad 10 mm. lata, numerosa, lateralia et marginalia, sessilia aut subpodieellata, primum cupuliformia, demum peltato-applanata. Excipulum extus radiatim crebre reticulato-nervosum. Discus tenuiter pruinosis, carneopallidus. Sporæ oblongæ, leviter curvatæ, apicibus obtusis aut rotundatis, long. 0.012 ad 0.014, crass. 0.004 ad 0.0045 mm. Valde affinis est *R. calicari* Nyl., at thallo opaco subcaesio et sporis leviter curvatis tenuioribusque ab ea differens.

MOSSAMEDES.—Non infreq. ad caules carnosos resinosos *Euphorbia decumbens* Welw. in collinis maritimis prope Mossamedes in Benguela. No. 23.

*R. farinacea* (L.) Ach. v. *phalerata* Ach. e Landana (leg. Pechuel-Loesche) in Müll. Arg. Lich. Afr. Occ. (Linnaea 1880), p. 32, commemoratur.

3. **PARMELIA** (Ach.) De Not.

1. **P. olivetorum** Nyl., Fl. 1869, p. 288, IIue, Addend. p. 40.

Var. **esorediata** Wain. Thallus esorediatus, superne glaucescens, opacus.

**GOLUNGO ALTO.**—Ad trunco vetusto in Serra de Alta Queta No. 109 pr. p. In Serra de Mongollo. No. 110. Etiam fert.

Species *Parmelia*, a Müll. Arg. in Lich. Afr. Occ. (Linnae 1880), p. 32, enumeratae, ob methodum defectum determinandarum Parmeliarum hujus auctoris hic omittentur.

Var. **sorediosa** Wain. Thallus margine sorediosus, glaucescens, sat opacus.

**CAZENGO.**—Ad trunco ramosque *Coffea arabica* in sylvis editis in Serra de Muxaúla. No. 112. Ster.

Var. **hyporysaea** Wain. Lojka, Lich. Univ. n. 61 (nomine *P. abessinica* ; haud Nyl., Fl. 1885, p. 608). Thallus glaucescens, opacus, esorediatus, subitus demum crebre rugulosus, nigricans. Medulla KHO non reagens,  $\text{CaCl}_2\text{O}_2$  rubescens. Apothecia circ. 7 ad 20 mm. lata, perforata, excipulo extus levigato aut ruguloso. Spore long. 0.015 ad 0.018, crass. 0.008 ad 0.010 mm.

**HUILLA** (3800 ad 5500 ped. s.m.).—Ad ramos fruticum in regionibus editioribus montis Morro de Lopollo. Nos. 6, 27. Ad trunco vetustos arborum in sylvis densioribus ad Lacum Magnum Hippopotamorum sive Ivantala. No. 26. Ad ramos arborum in summis rupestribus montis Serra da Xella. No. 28.

2. **P. nitens** Müll. Arg., Lich. Usamb. (1894) p. 255 (excl. var.), secund. specim. orig. in herb. Müll.

Thallus albidus aut cinereo-albicans, nitidus, esorediatus, isidiis destitutus, subitus levigatus, nigricans, ad ambitum fuscescens. Reactionibus cum *P. olivetorum* congruit, at sporis minoribus et thallo nitido ab ea differt et forsitan est autonoma species. Apothecia circ. 5-15 millim. lata, perforata, excipulo extus sat lavi. Spore longit. 0.012 ad 0.013, crass. 0.006 ad 0.007 millim.

**HUILLA.**—Frequenter ad rupes schistoso-arenosas in sylvaticis editis (5600 ped. s. m.) in Morro de Lopollo. No. 25.

3. **P. submarginalis** Michx., Fl. Bor.-Am. p. 325; Nyl. in Fl. 1885, p. 607.

**GOLUNGO ALTO.**—Ad trunco vetusto arborum in Serra de Alta Queta. No. 109 pr. p. Fert.

**LOANDA.**—Ad ramos e flumine Cuanza ejjectos inter Calumbo et ostia fluminis. No. 116. Fert.

4. **P. melanothrix** (Mont.) Wain., Étud. Brés. I. p. 30.

**GOLUNGO ALTO.**—Ad ramos arborum in sylvis editis in Serra de Cungulungulo. No. 108. Fert.

**PUNGO ANDONGO.**—Ad Vellorias in rupibus prope Presidium. No. 111 pr. p. Fert.

5. **P. coralloidea** (Mey. & Flot.) Wain., l.c., p. 33.

**INS. PRINCIPIS** (in situ Benin).—Haud infrequens ad basin trunctorum praecipue ad *Pentaclethra macrophyllum* in sylvis primavis editioribus in Pico de Papagaio. No. 118. Ster.

**INS. S. JACOBI** (Ins. Cap. Virid.).—In regionibus montosis interioribus insulae S. Jacobi freq. et olim qua *Estrellina* collecta et vendita. No. 117. Ster.

6. **P. Abessinica** Nyl. in Krempelh. Lich. Afr. p. 140, Fl. 1885, p. 608; Stizenb., Lich. Afr. p. 53.

Ad flumen Kongo legit Ledien, teste Stizenb., *l.c.*

7. **P. Soyauxii** Müll. Arg., Lich. Afr. Occ. (Linnaea 1880) p. 32.

Ad lapides prope Pungo Andongo in Angola lecta a Soyaux, teste Müll. Arg., *l.c.*

8. **P. perforata** (Jacq.) Ach.; Wain., *l.c.*, p. 38.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad basin truncorum in sylvis claris prope Praesidium. No. 115. Ster.

9. **P. sublævigata** Nyl. in Fl. 1885, p. 611; Wain., Etud. Lich. Brés. I. p. 53.

*P. Hookeri* Tayl. (Müll. Arg. Lich. Beitr. n. 1338) thallo isidioso ab hac specie differt.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad Vellosias in rupibus prope Praesidium. No. 111 pr. p. Fert. Ad ramos fruticis Caxinde-candange (i.e. *Myrothamnus flabellifolius* Welw. No. 1279) in rupibus editis prope Guinga Sobati Quibanga. No. 114 pr. p. Ster.

GOLUNGO ALTO.—Ad truncum arboris in sylvis prope Tange. No. 122. Ster.

10. **P. hypocraea** Wain., sp. n.

Affinis *P. quercinae* (Willd.) sive *P. tiliaceae* Nyl., at thallo subitus pallido et reactione thalli ab ea differens. Thallus superne glaucescenti-albidus, inferne pallidus, laciiniis circ. 5 ad 1.5 mm. latis, adpressis, crebre lobatis incisisque, axillis lacinularum rotundato-conniventibus, esorediatus, isidiis destitutus, subitus rhizinis brevibus, pallidis, subsimplicibus usque ad marginem instructus, KHO superne non reagens, intus lutescens et demum rubescens,  $\text{CaCl}_2\text{O}_2$  non reagens. Apothecia circ. 5 ad 2 mm. lata, applanato-eupuliformia, imperforata, sessilia, disco rufo, margine fisso aut subintegro, excipulo extus isidioso. Spore 8nae, ellipsoideæ, long. 0.012 ad 0.009, erass. 0.007 ad 0.006 mm. Hymenium jodo persistenter cærulescens. Paraphyses arcte cohærentes, neque ramosæ, nec connexæ, clavatae.

HUILLA (3800 ad 5500 ped. s. m.).—Ad corticem arborum Leguminosarum in sylvis densis juxta flumen Monino. No. 32 pr. p. Fert.

*P. leucorhiza* Wain. (*P. hypoleuca* in Lich. Ruwenz. p. 40, haud Müll. Arg., Lich. Beitr. n. 1145) thallo tenuiore et reactionibus ab hac specie differt.

11. **P. isidiza** Nyl. in Fl. 1885, p. 612; Wain., Etud. Lich. Brés. I. p. 48.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad ramos fruticis Cuxinde-candange (i.e. *Myrothamnus flabellifolius* Welw. No. 1279) in rupibus editis prope Guinga Sobati Quibanga. No. 114 pr. p. Ster.

Ad Serra Chella in Angola legit Newton teste Nyl., *l.c.*

12. **P. concrescens** Wain., sp. n.

Thallus superne glaucescenti-albidus, subitus niger, adpressus, crebre laciiniatus, laciiniis inæqualiter dilatatis, circ. 4 ad 0.5 mm. latis, planis, contiguis et passim confluentibus, apicibus subtruncatis, circ. 1 ad 0.5 mm. latis, irregulariter dichotome ramosis,

esorediatus, medium versus crebre isidiosus, isidiis brevibus, crassitudine medioeribus, subtus rhizinis brevibus inrebris instructus, medulla alba, KHO superne lutescens, intus non reagens,  $\text{CaCl}_2\text{O}_2$  non reagens. Apothecia juvenilia sola parce visa, cupuliformia, sessilia, parva, disco rufo, nudo, margine integro aut fiso. Pyenoconidia sub-bifusiformia, long. 0.006 ad 0.005, crass. 0.0007 mm., recta. Thallo magis irregulariter laciniato a *P. coasimili* Wain. differt.

HUILLA (3800 ad 5500 ped. s. m.).—Ad truncos in regione edita montis Serra da Nella. No. 30 pr. p.

13. **P. gracilescens** Wain., Etud. Lich. Brés. I. p. 53.

Var. **Angolensis** Wain.

Thallo minus nitido et laciniis magis confertis a *P. gracilescens* differt. Medulla thalli neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens.

HUILLA (3800 ad 5500 ped. s. m.).—Ad truncos in regionibus editis montis Serra da Nella. No. 30 pr. p. Ad truncos in Morro de Lopollo. No. 31 pr. p. Fert.

14. **P. Majoris** Wain., Lich. Madagase. p. 33.

HUILLA (3800 ad 5500 ped. s. m.).—Ad ramulos arborum in regionibus summis rupestribus montis Serra da Nella. No. 29. Ster.

GOLINGO ALTO.—Ad truncos *Melia* in Monte Cungulungulo. No. 118 (91 pr. p.). Ster.

15. **P. coronata** Fée, Ess. Crypt. Écore, p. 123; Wain., Etud. Lich. Brés. I. p. 59; Lojka, Lich. Univ. n. 159.

Var. **denudata** Wain.

Thallus neque isidiosus nec isidioideo-divisus.

HUILLA (3800 ad 5500 ped. s. m.).—Ad truncos Olacinearum (*Apodytes dimidiata* E. Mey.) in sylvis editis montis Morro de Lopollo. No. 33. Fert.

16. **P. subconspersa** Nyl., Fl. 1869, p. 293.

Var. **Benguellensis** (Welw.) Wain.

Thallus subtus usque ad ambitum nigricans, rhizinis parce instructus, neque sorediis nec isidiis instructus, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens.

HUILLA (3800 ad 5500 ped. s. m.).—Ad truncos arborum frondosarum semperiventrum in regione sylvatica montis Morro de Lopollo. No. 31 pr. maj. p. Fert. Ad truncos arborum in regionibus editis montis Serra da Nella. No. 30 pr. p. (parce immixta). Fert.

17. **P. conspersa** (Ehrh.) Sch.

HUILLA.—Ad saxa arenaria in regionibus editis (5600 ped. s. m.) montis Morro de Lopollo. Nos. 53 et 54 pr. p. Ster.

Medulla KHO lutescens et demum rubescens.

18. **P. Mougeotina** Nyl., Lich. Nov. Zel. (1888), p. 27; Hué, Nyl. Lich. Exot. p. 81.

*P. Mongeotii* Nyl., Lich. Angol. Welw. (1869), p. 4.

HUILLA.—Ad saxa arenaria in regionibus editis (5600 ped. s. m.) montis Morro de Lopollo. Nos. 53 et 54 pr. p. Ster.

Medulla KHO lutescens, KHO( $\text{CaCl}_2\text{O}_2$ ) lutescens, neque rubescens. Ster.

19. *P. prolixa* (Ach.) Nyl.

Var. *dendritica* (Pers.) Nyl., Lich. Scand. p. 192, Lich. Angol. Welw. p. 4.

MOSSAMEDES.—Ad saxa quartzitica in alta planicie inter Caroca et Cazimba in Cabo Negro. Nos. 48 et 49. Ster.

Habitu inter *P. sorediatum* (Ach.) Th. Fr. et *P. stygia* (L.) Ach. est intermedia, laciinis haud rugulosis, convexis, esorediatis a priore differens. Thallus conceptaculis pycnococnidiorum immersis cerebre instructus, laciinis circ. 0·5 ad 0·3 mm. latis, fusco-nigricantibus, sat opacis, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens. Stratum corticale superius cartilagineum, 0·018 ad 0·020 mm. crassum, cavitibus cellularum 0·0015 mm. latis, sicut in *P. sorediatum*. In *P. stygia* stratum corticale superius est circ. 0·050 mm. crassum.

## TRIB. II.—LECANOREÆ.

## I. CANDELARIA (Mass.) Wain.

1. *C. concolor* (Dicks.) Wain., Etud. Lich. Brés. I. p. 70.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos in sylvis prope Sange. No. 153 pr. p. Ster.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad Vellorias in rupibus prope Præsidium. No. 111 pr. p. Ster.

## 2. HÆMATOMMA Mass.

1. *H. puniceum* (Ach.) Wain.

Var. *esorediata* Wain., Etud. Lich. Brés. I. p. 72.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad truncum vetustum arboris e fam. Rosacearum in corona arboris 80 ad 90 ped. altit. in sylvis inter Luxillo et Præsidium. No. 140.

GOLUNGO ALTO.—Ad *Ficum pseudoclavatum* prope Canguera Sange (1000 ad 2400 ped. s. m.). No. 143. Ad corticem *Corynanthia paniculata*, in sylvis primitivis densis montis Serra de Alta Queta. No. 139.

## 3. LECANORA (Ach.) Wain.

1. *L. vitellina* (Ehrh.) Ach.

HUILLA.—Ad saxa calcarea prope cataractam Terraõ (? Ferrão da Sola) 6000 ped. s. m. teste Nyl., Lich. Angol. p. 6.

2. *L. subfuscata* (L.) Ach.

Var. *subcrenulata* Nyl., Lich. Nov.-Gran. Addit. (1867), p. 310. Wain., Etud. Lich. Brés. i. p. 77.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos in sylvis prope Sange. No. 144. Spore long. 0·014 ad 0·020, crass. 0·007 ad 0·008 mm. Ad truncos juniores in sylvis montis Serra de Alta Queta. No. 131.

3. *L. æquinoctialis* Stizenb., Lich. Afr. p. 114.

Ramulicola prope Banana ad ostium fluminis Kongo lecta a P. Hesse: Stizenb., l.c.

4. *L. albella* Ach. \**L. angulosa* (Ach.) Wain.

GOLUNGO ALTO.—Corticola ad Cungulungulo. No. 427 pr. p. Ad formam atypicam pertinet. Apothecia conferta, circ. 1 mm.

tata, disco livido-testaceo, tenuiter pruinoso, margine crenulato aut integro, crassitudine medioeri. Sporae long. 0.015 ad 0.010, crass. 0.006 ad 0.005 mm. Hymenium jodo persistenter caeruleascens.

5. **L. cinereocarnea** (Eschw.) Wain., Etud. Lich. Brés. I, p. 80.

GOLUNGO ALTO (1000 ad 2400 ped. s.m.)—Ad truncos juniores arborum in sylvis prope Sange. No. 135.

Var. **carneola** Wain.

Apothecia obscure subcarnea, tenuissime, sed distincte, pruinosa, margine tenuissimo, crenulato, persistente, disco convexiusculo.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.)—Ad truncos vigentes arborum in Alta Queta. No. 130.

Var. **rufocarnea** Wain.

Habitu sicut *L. cinereocarnea*, sed disco apotheciorum epruinoso, carneo-rufescente. Apothecia lat. 0.1 mm., crebra, disco plano aut demum convexiusculo, sat opaco, margine tenuissimo, crenulato, persistente. Sporae long. 0.012 ad 0.010, crass. 0.007 ad 0.006 mm. Sporis minoribus, disco minus nitido et margine tenuiore a *L. subfuscata* var. *subcrenulata* Nyl. differt et margine multo tenuiore a var. *chlorotera* (Nyl.) discrepat.

GOLUNGO ALTO (1000 ad 2400 metr. s. m.)—Ad truncos vigentes Anacardiacearum (*Spindalis*) in sylvis inter Sange et Trombeta. Nos. 129, 133, 348.

6. **L. monodoræ** sp. n. Welw. in herb.

Thallus crustaceus, effusus, tenuis, verruculosus aut verruculosoinequalis, esordiatus, KHO lutescens,  $\text{CaCl}_2\text{O}_2$  non reagens, hypothallo nigro. Apothecia crebra aut passim contigua, innata et dum subimmersa, demum subadpressa, parvula, 0.3 to 0.4 mm. lata, disco plano aut concaviusculo, pallido,  $\text{CaCl}_2\text{O}_2$  non reagente, epruinoso, margine tenuissimo, subintegro, discum vulgo hand superante. Hymenium totum decoloratum, jodo persistenter caeruleascens. Hypothecium decoloratum. Sporae 8nae, distichae, simplices, decolorantes, oblongae aut subelliptoideæ, long. 0.011 ad 0.013, crass. 0.005 mm. Attribuita est *L. cinereocarnea*, at apotheciis minoribus, diutius immersis, crebrioribus, epruinosis ab ea differens, et forsitan ejus subspecies.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.)—Ad truncos *Montodora Myristichea* in sylvis primaevis editis montis Cungulungno. No. 138.

7. **L. melanocardia** (Tuck.) Wain., Etud. Lich. Brés. I, p. 86.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.)—Ad truncos vetustiores arborum Combretacearum in sylvis primaevis juxta ripas fluminis Luinha. No. 137.

8. **L. atra** (Huds.) Ach.

**F. Americana** Müll. Arg., Rev. Lich. Fée (1887), p. 8. Wain., l.c., p. 93.

HUILLA. — Rarior ad truncos *Parinarii* in editis montis Morro de Lopollo (3800 ad 5500 ped. s. m.). No. 38.

9. **L. prosecha** Ach., Lich. Univ. (1810), p. 316; Wain., Lich. Antill. p. 5.

Var. *homaloplaca* (Nyl.) Wain.

*Lecanora homaloplaca* Nyl., Lich. Angol. p. 7.

PUNGO ANDONGO.—Ad rupes et lapides in monte Praesidii. No. 61 pr. p.

Thallus glaucescenti-albidus aut stramineo-glaucens, KHO lutescens et demum fulvescens. esorediatus. Apothecia fusca aut locis umbrosis etiam rubescens. In var. *rubescens* Wain., Lich. Antill. p. 5, transit.

#### 4. MARONEA Mass.

1. *M. horizoides* (Müll. Arg.) Wain.

*Lecanora horizoides* Müll. Arg., Lich. Parag. (1888), p. 10.

HUILLA (3800 ad 5500 ped. s. m.).—Ad trunco *Parinarii* in sylvis editis montis Morro de Lopollo. No. 40 pr. p.

Thallus fuscens, verrucosus et verruculosus, esorediatus. Discus fuscus, sat opacus. Ascii polyspori. Sporae long. 0.006, crass. 0.002 mm., oblongæ, simplices.

### TRIB. III.—PERTUSARIEÆ.

#### 1. PERTUSARIA DC.

1. *P. tropica* Wain., sp. n.

Habitu subsimilis est *P. commutata* Müll. Arg. et *P. multipuncta* (Turn.), at pseudostromatibus esorediatis. Thallus sat tenuis, continuus, leviter verruculoso-inaequalis, glaucescenti-cinerascens aut glaucescenti-albidus, neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens. Pseudostromata 0.5 ad 1, raro 1.2 mm. lata, elevata, basi haud constricta aut demum distincte constricta, apothecium unum continentia. Discus apotheciorum apertus dilatatusque, crebre albo-pruinosus, KHO violascens,  $\text{CaCl}_2\text{O}_2$  non reagens. Ascii membrana tota incrassata. Sporae solitariae, long. 0.115 ad 0.150, crass. 0.025 ad 0.045 mm., membrana circ. 0.010 ad 0.015 mm. crassa, stratis aequalibus, laevibus.

HUILLA (3800 ad 5500 ped. s. m.).—Ad corticem *Tarchomanthi* in summo monte Serra de Xella ante Mumpulla. No. 7 (parce).

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad corticem arboris Rosaceæ. No. 429.

2. *P. variolosa* (Krempehl.) Wain., Etud. Lich. Brés. I. (1890), p. 106.

Var. *simplex* Wain.

Pseudostromata apothecia subsolitaria continentia. Discus apotheciorum KHO intense lutescens,  $\text{CaCl}_2\text{O}_2$  non reagens. Thallus et pseudostromata neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagentia.

GOLUNGO ALTO.—Corticola ad Cungulungulo. No. 427 pr. p. Ad trunco *Zanthoxylum* in silvis primævis montis Serra de Alta Queta prope Sange. No. 435.

AMBACA.—Ad corticem arboris. No. 431.

*P. conglobata* (Ach.) Nyl. (*P. relata* Turn. ; Hue, Pert. p. 12) in Loango a Pechuel-Loesche lecta est, ut indicat Müll. Arg., Lich. Afr. Occ. p. 34.

3. **P. microthelia** Wain., sp. n.

Thallus crassitudine mediocris (circ. 0.5 mm.), diffracto-areolatus rimosusve, crebre verruculoso-rugulosus, flavido- vel stramineo-glaucosens, KHO intense lutescens,  $\text{CaCl}_2\text{O}_2$  non reagens. Medulla jodo levissime cerulescens. Apothecia circ. 0.5 mm. lata, thallo immersa aut parum elevata, sorediosa, albida. Sporae haud evolutae.

HUILLA (3800 ad 5500 ped. s. m.).—Ad rupes prope cataractam de Lopollo. No. 5. Ad rupes juxta cataractam prope Fazenda do Ferrão. No. 47.

4. **P. congesta** Wain., sp. n.

Thallus sat tenuis, leviter inaequalis, sordide albidus, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens. Pseudostromata thallo concoloria, circ. 0.8 ad 2 mm. lata, depresso-subglobosa, basi denum constricta, apice convexo, leviter verrucoso-inequalia, ostiolis nigris, punctiformibus, pseudostroma aequalibus, conferta et partim contigua, KHO neque extus nec intus reagentia, vulgo apothecia plura continentia. Sporae 2nae ad 8nae, saepe 4nae, long. 0.042 ad 0.075, crass. 0.020 ad 0.025 mm., membrana circ. 0.004 mm. crassa, stratis aequalibus, levigatis. A *P. tuberculifera* Nyl. sporis haud striatis et pseudostromatis verrucosis confertis et magis irregularibus differt.

GOLUNGO ALTO.—Ad truncos Leguminosarum in sylvis. No. 425.

5. **P. limbata** Wain., Etud. Lich. Brés. I. p. 110.

AMBRIZ.—Ad corticem Spondiaceae Neumbi (i.e. *Calesium antiscorbutica* Hiern, Welw. No. 4450). No. 426.

Sporae 8nae, monostichiae, long. 0.060 ad 0.080, crass. 0.030 ad 0.035 mm., intus luteae aut albidae, membrana 0.006 mm. crassa, stratis aequalibus, levigatis.

6. **P. glauccinerea** Wain., sp. n.

Thallus crassitudine mediocris, crebre verruculoso-rugulosus, glauco-cinereus, KHO intus fulvescens, extus non reagens. Pseudostromata thallo concoloria, circ. 0.8 ad 1.5 mm. lata, depresso-subglobosa, basi denum constricta, apice convexo aut rarius levissime impresso, leviter verrucoso-inequalia, ostiolis nigricantibus, pseudostroma aequalibus aut leviter prominulis, punctiformibus, crebra, KHO intus fulvescentia, extus haud reagentia, apothecia 1 ad 5 continentia. Sporae 8nae, distichiae, long. 0.050 ad 0.100, crass. 0.020 ad 0.028 mm., membrana intus striata aut in eodem apothecio etiam stratis levigatis, exosporio sat tenui, haud mucoso.

GOLUNGO ALTO.—Ad ramulos arboris Artocarppearum in sylvis primaevis montis Serra de Alta Queta. No. 434.

7. **P. crebra** Wain., sp. n.

Thallus sat tenuis, leviter inaequalis, albidus vel glaucescenti-albidus, rimosus, KHO non reagens. Pseudostromata 0.5 ad 0.8 mm. lata, depresso-subglobosa, basi constricta, apice vulgo convexo et cinereo-pallido, ostiolis cinereis vel obscuris, punctiformibus, leviter prominentibus, conferta, KHO intus fulvescentia.

apothecia 1 ad 4 continentia. Sporæ 8næ, monostichæ aut distichæ, long. 0·020 ad 0·030, crass. 0·010 ad 0·016 mm., membrana sat tenui, haud mucosa, stratis lævigatis.

GOLUNGO ALTO.—Ad truncos vigentes in sylvis primævis montis Serra de Alta Queta. No. 436.

8. **P. Angolensis** Wain., sp. n.

Thallus tenuissimus aut evanescens, albidus. Pseudostromata hemisphaerica aut conoidea, 0·3 ad 0·5 mm. lata, ochracea aut albida, KHO intense lutescentia, apice convexo, ostiolo punctiformi, nigricante pseudostroma subæquante, apothecium unum continentia aut raro duo confluentia. Sporæ binæ aut 4næ aut 8næ, monostichæ, long. 0·065 ad 0·090, crass. 0·018 ad 0·030 mm., membrana circ. 0·004 mm. crassa, haud mucosa, stratis sat equalibus lævigatis.

Var. **ochracea** Wain. Pseudostromata ochracea. Sporæ binæ.

GOLUNGO ALTO.—Ad truncos *Grewia* locis arboribus rare obsitis in montibus Serra de Alta Queta. No. 442 pr. p.

Var. **albella** Wain. Psendostromata albida. Sporæ 4næ—8næ. In eodem specimine cum var. *ochracea*.

9. **P. cryptocarpoides** Wain., Etud. Lich. Brés. I. p. 112.

GOLUNGO ALTO.—Ad ramulos arboris "dizanha" (i.e. *Treculia africana*) in sylva juxta basin montis Serra de Alta Queta. No. 183. Fert.

Sporæ long. circ. 0·042 ad 0·050, crass. 0·018 ad 0·020 mm., 8næ ad 4næ, monostichæ aut distichæ, stratis membranæ lævigatis.

10. **P. arthonioides** Wain., sp. nov.

Thallus sat tenuis aut mediocre, rugosus, pallido-albidus, KHO neque extus, nec intus reagens. Pseudostromata indistincta aut demum leviter elevata, irregularia, apothecia vulgo plura (1 ad 7) continentia. Ostiolum arthoniemorphum, dilatatum, rotundatum aut ellipsoideum, latitudine circ. 0·2 ad 0·4 mm., pallidum, pseudostroma aequans. Ascii cylindrici. Sporæ 8næ, imbricato-monostichæ, aut distichæ, stratis aequalibus, lævigatis, haud gelatinosis, long. 0·060 ad 0·066, crass. 0·025 ad 0·028 mm.

GOLUNGO ALTO.—Ad truncum arboris (Mutala-Menza Cafele, i.e. *Millettia nudiflora* Welw. No. 1850) in sylvis. No. 174 pr. p.

TRIB. IV.—THELOSCHISTÆ.

1. **THELOSCHISTES** (Norm.) Th. Fr.

1. **Th. flavicans** (Sw.) Müll. Arg.

**F. glabra** Wain., Etud. Lich. Brés. I. p. 114.

GOLUNGO ALTO.—Frequenter ad ramulos emortuos arborum in omnibus declivibus sylvaticis montis Serra de Alta Queta. Nos. 82 et 83 pr. p.

Thallus sorediosus. Raro fert.

**F. cinerascens** Stein.; Müll. Arg., Lich. Afr. Trop. (1890), p. 338.

Thallus glaucescens aut. passim pareo fulvo-glaucens, glaber, striis abbis passim instructus. Apothecia haud fibrillosa.

GONGO ALTO.—Ad ramulos arborum in editis (2800 met. s.m.) montis Cungulungulo. No. 83 pr. p. Fert.

2. **Th. scorigena** (Mont.) Wain.

*Evernia* Mont., Syll. p. 318. *Leccinaria* Nyl., Lich. Angol. p. 5.

Thallus maxima parte ex hyphis irregulariter contextis conglutinatis formatus, cavitate cellularum angusta elongata, membrana modice incrassata, chondroideus, cavitatibus laxioribus gonidia (*Cystococcum*) continentibus passim instructus.

MOSAMEDES.—Frequenter ad rupes conchiferas (calcareas) prope Pedras de D. João II. (? Don João segundo) in Cabo Negro. No. 22. Fert.

2. **PLACODIUM** (DC.) Tul.

1. **Pl. elegans** (Link) Ach.

MOSAMEDES.—Ad lapides dispersas calcareas in summo jugo (500 ad 600 ped. s. m.) montis Serra de Montes Negros. Nos. 43, 483. Ster. (parecissime fructifera teste Welw.).

2. **Pl. elegantissimum** (Nyl.) Wain.

*Leccinaria elegantissima* Nyl., Lich. Angol. p. 5.

MOSAMEDES.—Ad saxa quartzosa in montibus arenaceis, arena volatili lectis inter Caroca et Cazimba (4 ad 6 mil. dist. ab Oceano) prope Cabo Negro. Nos. 45, 48 pr. p., 49 pr. p.

3. **Pl. flavorubens** Nyl., Lich. Angol. p. 5.

*Leccinaria* Nyl. in Cramb. Lich. Chall. p. 212.

INS. CAPITIS VIRIDIS.—Ad rupes vulcanicas in Monte Verde 300 ped. s. m. in insula S. Vincenti. No. 162. Fert.

4. **Pl. cinnabarinum** (Ach.) Anzi.

MOSAMEDES. Frequenter ad rupes schistosas verticales inter Maiombo et Cazimba. No. 14.

HUILA (3800 ad 5500 ped. s. m.).—Ad rupes juxta cataractas Ferrão da Sola. Nos. 434 pr. p., 46 pr. p. Ad saxa arenaria in editis montis Morro de Lopollo. Nos. 53, 54 pr. p., 11<sup>h</sup> pr. p.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad rupes et lapides in summis jugis montium ad Cunha da Pedra Cazella. No. 62 pr. p. Frequentissime ad rupes in editis ipsius Praesidii. Nos. 481 pr. p., 60 pr. p., 61 pr. p., 161 (480 pr. p., 482).

Var. **pallidior** (Müll. Arg.).

Ad Pungo Andongo a Soyaux lecta est teste Müll. Arg., Lich. Beitr. n. 333.

5. **Pl. ferrugineum** (Huds.) Hepp.

Var. **pyrithromoides** Wain.

*Leccinaria pyracea* f. *pyrithroma* Nyl., Lich. Angol. p. 6.

Thallus albus, sat tenuis. Apothecia minuta (circ. 0.2 ad 0.3 mm.), aurantiaca, margine tenuissimo concolore demum excluso, diu thallo semi-immersa.

MOSAMEDES.—In summo jugo (500 ped. s.m.) in Montes Negros.

No. 51 pr. p. Ad rupem schistosam perpendicularem inter Maiombo et Cazimba una cum v. *Benguellensi* (Nyl.). No. 17 pr. p.

Affinis est v. *lamprocheila* (DC.) Wain. (= v. *festivae* Ach.).

Var. **Benguellensis** (Nyl.) Wain.

*Lecanora Benguellensis* Nyl., Lich. Angol. p. 6.

MOSSAMEDES.—Ad rupes schistosas perpendiculares inter Maiombo et Pomanala in Serra de Cazimba. Nos. 485 pr. p., 17 pr. p.

Margine apotheciorum nigricante differt a var. *lamprocheila* (DC.) Wain. (v. *festivae* Ach.), quae interdum item observatur margine partim nigricante. Thallus est obsoletus. Discus ferrugineus.

6. **Pl. polioterum** (Nyl.) Wain.

*Lecanora poliotera* Nyl. in Fl. 1869 p. 70. *Blastenia* Müll. Arg., Lich. Afr. Occid. (Linnaea 1880), p. 36.

Ad lapides prope Pungo Andongo leg. Soyaux teste Müll. Arg., l.c. Variatio sit *Pl. ferruginei*, proxime affinis var. *Benguellensi* (Nyl.).

7. **Pl. Brebissonii** (Fée) Wain.

*Lecidea* Fée, Ess. Crypt. Ecorc. Suppl. (1837), p. 108. *Blastenia* Müll. Arg., Lich. Beitr. n. 1034.

Var. **microspora** Wain.

Apothecia margine denum cinereo, primum ferrugineo et disco concolore. Spore long. 0·020 ad 0·024, crass. 0·012 ad 0·013 mm., 2-septatae.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad ramos in coronis *Sponia* (i.e. *Celtis Soyauxii*; Welw. No. 6298) in sylva juxta ripas rivi Cuango prope Sange. No. 156.

Sporis cum *Pl. crocea* (Kremp., Fl. 1876, p. 317) congruit.

### TRIB. V.—BUELLIEÆ.

#### 1. ANAPTYCHIA Koerb.

1. **A. leucomelæna** (L.) Wain., Etud. Lich. Brés. I. p. 128.

Var. **vulgaris** Wain., l.c.

GOLUNGO ALTO.—Ad ramos arboris Euphorbiaceæ in Mata Quisucula. No. 99 pr. p. Fert. Ad ramos arboris in Alta Queta. No. 99b.

Var. **multifida** (Mey. et Flot.) Wain., l.c.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Frequenter ad rupes gneissaceas Praesidii. No. 100.

GOLUNGO ALTO.—Frequenter in arboribus ad Cungulungulu. No. 102. Etiam fert.

INS. CAPITIS VIRIDIS.—In montosis editioribus Ins. Jacobi frequenter. No. 101.

F. **squarrosa** Wain.

Thallus laciiniis angustis (sicut in v. *multifida*), fibrillis nigricantibus, squarrosa-ramosis.

HUILLA (3800 ad 5500 ped. s. m.).—Ad ramos arborum in summo jugo montis Serra da Xella (ubi hæc species frequenter obvenit). No. 34. Fert.

2. **A. palpebrata** (Tayl.) Wain.

*Physcia leucomela* v. *subramosa* Nyl., Syn. Lich. p. 114 (Müll. Arg., Lich. Beitr. n. 1349)

Habitu similis *A. galactophyllo* (Tuck.) et *A. podocarpa* (Bel.), at fibrillis subsimilicibus parce in parte superiore thalli (secund. coll. Mandon n. 1766 bis, 1859, in mus. Paris.).

GOLUNGO ALTO.—Ad ramos arboris Euphorbiaceae in Matta de Quisueulo. No. 99 pr. p. Ster.

3. **A. hypoleuca** (Mühlb.) Wain. \* **A. dentritica** (Pers.) Wain., Etud. Lich. Brés. i, p. 134.

GOLUNGO ALTO.—Ad ramos museosos arborum in sylvis editis primitivis montis Cungulungulo. No. 98. Ster.

4. **A. speciosa** (Wulf.) Wain.

Var. **esorediata** Wain. Thallus laciniis esore latis, margine subintegris.

HUILLA (3800 ad 5500 ped. s. m.).—Ad trunco in sylvis editoribus in Morro de Lopollo. Nos. 35 pr. p. 39. Etiam fert.

GOLUNGO ALTO.—Ad trunco Leguminosarum prope Trombeta No. 106. Fert.

Var. **lobulifera** Wain.

Thallus laciniis margine denum minute crenulatis, esorediatis.

HUILLA (3800 ad 5500 ped. s. m.).—Ad trunco *Parinarii* in sylvis editoribus in monte Morro de Lopollo. No. 35 pr. p. Fert.

5. **A. isidiophora** (Nyl.) Wain.

Similis *A. speciosa*, at thallus margine isidiosus, isidiis brevibus, subcylindricis. Thallus superne et inferne strato corticali obductus, rhizinis pallidis subsimilicibus inferne instructus, esorediatus, KHO superne et intus lutescens. Apothecia margine denum isidioso, haud distincte laciniato. Thallo fere solum margine isidioso et reactione thalli a *A. granulifera* (Ach.) differt. *Ph. Domingensis* f. *isidiophora* Nyl. (Hue, Lich. Exot. p. 110) hue pertinet.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad rupes perpendiculares juxta riuulos ad Barranco da Pedra Songue frequenter, at raro fructificans. No. 96.

6. **A. granulifera** (Ach.) Wain.

*Parmelia granulifera* Ach., Syn. Lich. (1814), p. 212 (secund. herb. Ach.).

Thallus superne albidus aut glaucescenti-albidus, subitus albidus aut pallidus et rhizinis pallidis aut obscuratis inerebris subsimilicibus sat brevibus instructus, superne et inferne strato corticali obductus, laciniis adpressis, irregularibus, planis aut concavis velis, in margine et superficie granulis isidioideis vulgo subglobosis instructus, KHO superne lutescens, intus primum lutescens et denum rubescens (etiam in specimine orig. in herb. Ach.), ambitum versus superne tenuissime pruinosus (f. *pruinosa* Wain).

GOLUNGO ALTO.—Ad basin truncorum pruinosentium in Serra de

Alta Queta. No. 104. *Supra Frullaniam squarrosum* ad radices Orchidearum parasiticarum *Camoensie* florigeræ in Mata de Quibanga. Nos. 97, 75. Ster.

2. **PHYSCKIA** (Schreb.) Wain.

1. **Ph. integrata** Nyl.

Var. *sorediosa* Wain., Etud. Lich. Brés. I. p. 142.

GOLUNGO ALTO.—Ad trunços vigentes Artocarpearum cet. in sylvis prope Sange. Nos. 119, 93 pr. p. Ster.

2. **Ph. cæsia** (Hoffm.) Nyl.

Ad lapides prope Pungo Andongo leg. Soyaux teste Müll. Arg., Lich. Afr. Occ. (Linnæa 1880), p. 33 ("var. *teretiuscula* Nyl.").

3. **Ph. triseptata** Wain., sp. n.

Thallus superne glaucescenti-albidus, opacus, KHO superne et intus intense lutescens, irregulariter crebre laciniatus, laciniis adpressis, planiusculis, inaequaliter dilatatis cuneatisque, circ. 1 ad 4 mm. latis, contignis, subitus pallidus, rhizinis brevibus, vulgo sat crebris, simplicibus, pallidis instructus, esorediatus, isidiis destitutus. Apothecia circ. 2 ad 1 mm. lata, disco fusco-nigro aut fusco, nudo aut tenuissime pruinoso, plano, margine sat tenui aut mediocri, integro, discum leviter aut parum superante. Excipulum effibrillosum. Hypothecium albidum. Sporæ 8næ, distichæ, fuscescentes, primum 1-septatae, demum 3-septatae, septis poro instructis, long. 0·022 ad 0·026, crass. 0·008 ad 0·010 mm. Habitu valde similis est *Ph. integrata* var. *obsessæ*, at sporis 3-septatis et thallo inferne pallido ab ea differens.

GOLUNGO ALTO.—Ad corticem *Spond.* tuberosæ prope Sange. No. 93 pr. p.

4. **Ph. obscura** (Ehrh.) Th. Fr.

Var. *cycloselis* (Ach.) Wain.

GOLUNGO ALTO.—Ad ramos fruticum in sylvis non densis ad latera montium in Alta Queta. No 105. Ster.

5. **Ph. syncolla** Tuck.; Wain., Etud. Lich. Brés. I. p. 148.

PUNGO ANDONGO (2400 ad 3800 ped. s.m.).—Ad ramulos Vellosiarum in editis rupibus Praesidii. No. 107. Fert.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad ramos arborum in sylvis prope Sange. No. 132. Fert. Ad corticem arboris Zanthoxyleæ ad Zengas do Queta. No. 94 pr. p. Fert.

6. **Ph. (Dirinaria) pieta** (Sw.) Wain., Etud. Lich. Brés. I. p. 150.

GOLUNGO ALTO.—Ad trunços arborum in sylvis junioribus prope Sange. No. 121a. Fert. Thallus sorediosus.

Var. *rupicola* Bagl. teste Müll. Arg., Lich. Afr. Occ. (Linnæa 1880), p. 33, supra saxa granitica ad ostium flum. Banya ad Mayumbe a Pechuel-Loesche lecta est.

7. **Ph. palmarum** Wain. sp. n.

Thallus cinereo-glaucescens aut albidus, subitus obscuratus, KHO superne lutescens, intus non reagens, irregulariter crebre

laciniatus, laciniis adpressis, ad ambitum planis, confluentibus, circ. 0.5 ad 0.7 mm. latis, valde tenuibus, esorediatus isidiis destitutus, rhizinis nullis distinctis. Apothecia disco plato, nigro, nudo, margine subintegro aut crenulato, discum aequante, circ. 2 ad 1 mm. lata. Hypothecium fuscofuligineum. Epitheciun fuscescens. Spore 8nae, distichae, long. 0.013 ad 0.018, crass. 0.005 ad 0.008 mm., 1-septatae, septo sat tenui, membrana ad apices crassiore. A *Ph. argialita* (Ach.) Nyl. (Wain., Lich. Bras. Exs. n. 148) thallo multo tenuiore, laciniis angustioribus et sporis minoribus facile distinguitur.

**F. sophodes** Wain.

Thallus denum centrum versus verrucoso-inaequalis, cinereo-glaucescens.

INS. PRINCIPIS.—Ad cortices palmarum (*Elaeis guineensis*) aliarumque arborum prope Pico de Papagaio non infreqvrens. No. 95 pr. p. Fert.

AMBRIZ.—In n. 123/ adest planta omnino similis, at KHO non reagens. Ad truncos arborum in sylvis claris inter Ambriz et Mussulo lecta. Forsan est species autonoma, at nimis parce visa. Nominetur **Ph. (Dir.) areolata** Wain.

**F. undulata** Wain.

Thallus laciniis longitudinaliter undulatis rugosissime, albidis.

INS. PRINCIPIS.—Ad cort. (*Elaeis guineensis*) prope Pico de Papagaio. No. 95 pr. p. Fert.

**8. Ph. Africana** Müll. Arg., Lich. Afr. Occ. (Linnaea 1880), p. 33.

*Ph. picta* \**Ph. Africana* Stizenb., Lich. Afr. p. 80.

Thallo plumbeo-cinereo v. fuscescenti-plumbeo et rigidiore a *Ph. palmarum* differt et saxicola est.

Ad lapides prope Pungo Andongo. Fert.—*Ph. picta* f. *isidiophora* Nyl., Fl. 1867, p. 3, teste Müll. Arg., l.c., eum v. *rupicola* Bagl. a Péchuel-Loesche lecta est. Species autonoma sit, nam in *Ph. picta* thallus numquam est isidiosus, at a me non est visa.

**9. Ph. erythrocardia** (Tuck.) Wain.

*Pyxine picta* \**erythrovardia* Tuck., Syn. North. Am. Lich. (1882), p. 79. *Physcia picta* var. *coccinea* Müll. Arg., Lich. Beitr. (1885), n. 937.

Thallus esorediatus, denum verrucoso-rugosus, subtus nigricans, rhizinis indistinetis, medulla partim miniato-rubescente, partim alba, laciniis ad ambitum tenuibus, planis, circ. 0.5 ad 1 mm. latis, adpressis, bene confluentibus, superne cinerascens aut flavidoglaucescens, KHO superne haud reagens, intus partibus albis haud reagentibus, partibus rubris violaceis. Apothecia 1.5 ad 1 mm. lata, disco nigro, nudo, planiusculo, margine subintegro, discum leviter aut parum superante, materiali rubescens continente. Hypothecium fusco-nigrum. Spore 8nae, distichae, long. 0.012 ad 0.022, crass. 0.006 ad 0.008 mm., 1-septatae, septis crassis, poro instructis, apice membrana bene incrassata.

LOANDA.—Ad ramulos fruticis *Balsamodendri* prope Maianga do Povo rara. No. 103 pr. p. Fert. Ad ostium fluminis Kongo lecta a P. Hesse, teste Stizenb., Lich. Afr. p. 80.

10. **Ph. reticulata** Wain. sp. n.

Thallus livido-albicans aut cinereo-pallescens, minute albido-reticulatus et ambitum versus leviter pruinosis, KHO superne flavescentis, intus non reagens, irregulariter laciniatus, laciniis adpressis, planis, contiguis et leviter confluentibus, cire. 2 mm. latis, centrum versus soraliis rotundatis, elevatis, minute sorediosis instructus, subtus obscuratus, rhizinis brevibus simplicibus obscuratis instructus. Apothecia incognita. Habitu similis est *Ph. aegialitea* var. *hypotrachynae* Wain. (Lich. Bras. Exs. n. 163), thallo rhizinis instructo cum ea congruens, at sorediis ab ea differens.

AMBRIZ.—Ad truncos arborum in sylvis claris inter Ambriz et Mussulo. No. 123b.

3. **PYXINE** Fr.

1. **P. Meissneri** Tuck., Obs. Lich. i. (1860), p. 400; Wain., Etud. Lich. Brés. I. p. 153.

Var. **subobscurascens** Malme, Pyxin. p. 37.

Thallus esorediatus, medulla passim materiam ochraceo-fulvescentem KHO dilute purpurascentem continens. Excipulum materiam ochraceo-fulvescentem continens. Sporae long. 0·015 ad 0·019, crass. 0·005 ad 0·007 millim. Hypothecium KHO non reagens. Epithecium olivaceum aut smaragdulum, KHO violascens. Stratum corticale excipulum fuscescens, KHO violascens.

HUILLA.—Ad truncos vigentes *Apodytes dimidiata* E. Mey. in sylvis editis prope Lopollo (3800 ad 5500 ped. s. m.). No. 8 pr. p. Fert.

2. **P. chrysanthia** Wain.

Thallus sat tenuis, superne cinereo-glaucens, epruinosis, soraliis minutis albidis aut fulvis instructus, medulla fulva, KHO neque superne nec intus reagens, laciniis circ. 0·5 (passim etiam 1) mm. latis, irregularibus subcuneatisque, continuis contiguisque, radiantibus, planis, levigatis, subtus nigricantibus. Apothecia parce visa (0·7 mm. lata), margine nigricante, haud diu thallode instructa, disco nigro nudo. Excipulum intus subalbidum, extus in margine fuligineum et KHO violascens, inferne dilute smaragdulum, KHO non reagens. Hypothecium fuscescens, KHO non reagens. Epithecium olivaceo-smaragdulum, KHO solutionem violaceam effundens. Sporae fuscescentes, membrana inaequaliter incrassata, in apicibus crassiore, vulgo 1-septatae, pr. p. 2-septatae, raro 3-septatae, long. 0·014 ad 0·020, crass. 0·005 ad 0·007 mm. Affinis est *Pyxini Meissneri* Tuck. Huc verisimiliter pertinet *P. cocoës* v. *chrysanthia* Müll. Arg., Lich. Afr. Trop. (1890), p. 341, tantum sterilis descripta.

GOLUNGO ALTO.—Ad corticem arboris in sylvis primævis prope Sange. No. 178 pr. p.

3. **P. endoleuca** (Müll. Arg.) Wain., Lich. Ruwenz. p. 10.

*P. Meissneri* v. *endoleuca* Müll. Arg., Lich. Beitr. (1879), n. 118.

GOLUNGO ALTO.—Ad truncos vigentes in sylvis primævis prope Sange. No. 120. Fert.

4. **RINODINA** Mass.1. **R. Huillensis** Wain., sp. n.

*Lecanora sophodes* Nyl., Lich. Angol., p. 6 (haut Ach.).  
 Thallus crustaceus, rimoso-areolatus, areolis 0·3 ad 0·4 mm. latis, angulosis, contiguis, planis, levigatis, badio- aut olivaceo-fusecentibus, opacis, sat tenuibus, hypothallo nigricante. KHO non reagens. Apothecia thallo immersa, 0·2 ad 0·3 mm. lata, disco fusco-nigricante, nudo, plano, marginé thallode tenui, thallo concolore, integro, parum distincto. Hymenium jodo persistenter caerulescens. Hypothecium albidum. Epithecium fuscescens. Paraphyses laxe cohaerentes. Spore 8næ, distichæ, long. 0·013 ad 0·016, crass. 0·006 ad 0·008 mm., haud constrictæ, apice membrana crassiore, 1-septatae, septa sat crassa, poro lato. Habitu similis est *R. Budensi* (Nyl.), qui sporis longioribus et apotheciis demum elevatis ab ea differt. *R. milrina* (Wahlenb.) thallo verruculoso et membrana sporarum aequaliter incrassata ab ea distinguitur. *R. sophodes* (Ach.) ei parum est affinis.

HUILLA (3800 ad 5500 ped. s.m.).—Ad rupes juxta cataractam Ferrão prope Lopollo. Nos. 50, 46 pr. p.

5. **BUELLIA** De Not.1. **B. disciformis** (Fr.) Br. et Rostr.; Wain., Etud. Lich. Brés. I., p. 165.

Var. **minor** Fr. f. **rugulosa** (Ach.) Wain., Adj. Lich. Lapp. II., p. 112.

GOLUNGO ALTO.—Ad ramos *Fici trachyphylla* (Muñoso) in ambulacris prope Sange. No. 163. Ad ramos Artocarpearum in sylvis primævis (No. 180), et ad ramos Grewiarum in sylvis inerebris (No. 207), in Serra de Alta Queta. Ad trunco vetustos *Melia* (No. 182), et ad trunco juniores (No. 175), in sylvis primævis ad Cungulungulo.

Var. **rhodina** Wain. Thallus crassitudine mediocris, verrucosus et verruculoso-inaequalis, medulla passim rosea, materiam rubram parce continens. Sporæ 1-septatae, long. 0·014 ad 0·018, crass. 0·006 ad 0·008 mm.

GOLUNGO ALTO.—Ad trunco arboris Mangue do monte dictæ (i.e. *Corynanthe paniculata*) in Alta Queta. No. 176.

2. **\*B. rosellotincta** (Nyl.) Wain.

*Lecidea disciformis* var. *rosellotincta* Nyl., Syn. Lich. Nov. Caled. p. 52.

Thallus verrucosus et verruculosus, extus et intus rubescens. Sporæ 1-septatae, long. 0·016 ad 0·020, crass. 0·005 ad 0·007 mm.

GOLUNGO ALTO.—Ad trunco vigentes arborum in sylvis primævis prope Sange. No. 178.

3. **\*B. subdisciformis** (Leight.) Wain., Etud. Lich. Brés. I., p. 167.

HUILLA (3800 ad 5500 ped. s. m.).—Ad trunco *Apolytis dimidiata* E. Mey. in sylvis editioribus prope Lopollo. Nos. 9, 10.

4. **\*B. lauricassiae** (Fee) Wain.

*Lecidea lauricassiae* Fee, Ess. Crypt. Eccl. Suppl. (1837), p. 48.

*Buellia lauricassiae* Müll. Arg., Rev. Lich. Fée (1887), p. 4.  
*Lecidea triphragmia* Nyl., Prodr. Lich. Gall. (1857), p. 141.

Thallus KHO lutescens. Sporæ 3-septatae, long. circ. 0.018, crass. 0.006 mm.

GOLUNGO ALTO.—Ad trunacos in sylvis primævis prope Sange. No. 179.

5. **B. subalbula** (Nyl.) Müll. Arg., Lich. Egypt. (1880), p. 18 (excl. var.). *Lecidea* Nyl., Lich. Angol. p. 11.

MOSSAMEDES.—Ad lapides calcareas dispersas in summo jugo (500 ad 600 ped. s.m.) in Serra de Montes Negros. Nos. 2 pr. p., 12, 15 pr. p., 51 pr. p. Ad rupes calcareas in alta planicie inter Caroca et Cazimba. No. 52.

Medulla jodo non reagens. No. 15. Pertinet ad f. *miniatoreagentem* Wain. Hujus hypothecium KHO solutionem luteam, demum crystalla rubra formantem, effundens.

6. **B. anatolodia** Mass., Lich. Cap. p. 35; Müll. Arg., Lich. Afr. Occ. p. 36.

Ad saxa granitica prope Mayumba ad ostium flum. Banya leg. Pechuel-Loesche teste Müll. Arg., l.c.—*Dimelasma Stanleyi* Stein, Afr. Flecht. (1888), p. 8, supra lapides quartzosos prope Vivi ad flumen Kongo a Ledien lecta est.

7. **B. punctiformis** (Hoffm.) Mass.

*Patellaria myriocarpa* DC., Fl. Fr. 3, ed. II. (1805), p. 346.

**F. stigmataea** (Koerb.) Wain.

*Buellia stigmataea* Koerb., Syst. Lich. Germ. p. 226.

INS. CAPITIS VIRIDIS.—Ad rupes vulcanicas in ins. St. Vincent circ. 300 ped. s.m. No. 66.

8. **B. rinodinea** Mass., Lich. Cap. (1861), p. 31.

*Lecidea ocellata* Floerk. f. *purior* Nyl., Lich. Angol. (1869), p. 11. Haud *Buellia verruculosa* (Borr.) Th. Fr., Lich. Scand. p. 600 (*L. ocellata* Floerk., *L. Kaleida* Tayl., Müll. Arg., Lich. Beitr. n. 1426).

Thallo  $\text{CaCl}_2\text{O}_2$  non reagente et hypothecio pallido a *B. verruculosa* (Borr.) Th. Fr. differt. Ad species inter *Buellias* et *Rinodinas* intermedias pertinet, perithecio laterali nigricante passim evoluto, passim deficiente, in basi apothecii perithecio semper deficiente.

HUILLA.—Ad saxa arenaria in summo monte Morro de Lopollo (5600 ped. s.m.). Nos. 53 pr. p., 54 pr. p.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad lapides gneissaceas in summo monte Pedra de Cazella. Nos. 64 pr. p., 480 pr. p.

9. **B. stellulata** (Tayl.) Br. et Rostr.; Wain., Etud. Lich. Brés. I. p. 174.

HUILLA (3800 ad 5500 ped. s.m.)—Ad saxa arenaria prope cataractam Ferrão da Sola. No. 484 pr. p., 11 pr. p. Ad rupes arenarias in Morro de Lopollo. No. 11b pr. p.

PUNGO ANDONGO.—Ad saxa arenaria in summis jugis Præsidii (2400 ad 3800 ped. s. m.). No. 60 pr. p.

**F. subtilis** Wain.

Thallus albidus, KHO leviter flavescens, areolis 0.1 ad 0.2 mm. latis. Apothecia 0.1 ad 0.2 mm. lata. Hypothecium fuscoculigineum. Spore long. 0.009 ad 0.008, crass. 0.005 mm. Hypothallus nigricans ad ambitum distinctus. Apothecii et areolis thalli minoribus a type differt, et a *B. punctiformi* et *stigmatica* fere solum reactione distinguitur.

PUNGO ANDONGO.—Ad rupes et lapides in summo monte Pedra de Cazella. No. 64 pr. p.

**10. B. depressa** Wain., sp. n.

Thallus crustaceus, uniformis, sat tenuis, areolatus, cinereus, KHO non reagens, areolis 0.1 ad 0.25 mm. latis, angulosis, planis, contiguis, fissuris nigro-limitatis, medulla jodo non reagente, hypothallo nigricante. Apothecia 0.2 ad 0.15 mm. lata, thallo immersa, humida fusca, secca nigra, nuda, opaca, plana, immarginata aut margine tenuissimo nigricante. Hypothecium albidum. Excipulum proprium basi albidum, latere fuscoculigineum tenuem aut partim indistinctum. Epitheciun fuscescens, KHO non reagens. Spore 8na, distichae, fuscae, 1-septatae, long. 0.008 ad 0.011, crass. 0.006 ad 0.007 mm.

PUNGO ANDONGO.—Ad lapides quartzosos in monte Praesidii. No. 61 pr. p. Ad rupes et lapides gneissaceas in summo monte Pedra de Cazella (2400 ad 3800 ped. s. m.). Nos. 64 pr. p., 480 pr. p., 481 pr. p.

Ad species inter *Buellia* et *Rinodina* intermedias pertinet. Habitum fere similis est *Lecanora* (*Aspicilia*) *gibbosa*, sed minor.

**11. B. recepta** (Krempehl.) Müll. Arg., Lich. Afr. Oec. (Linnaea 1880), p. 36. *Lecidea* Krempehl., Fl. 1876, p. 318.

Ad lapides prope Pungo Andongo leg. Soyaux teste Müll. Arg., *l.c.*

**12. B. Afra** (Stizenb.).

*Lecidea Afra* Stizenb., Lich. Afr. II, p. 175. *Buellia Africana* Müll. Arg., Lich. Beitr. (1879), n. 123, hand *Lecidea* (*Buellia*) *Africana* Tuck, in Proceed. Am. Acad. of Arts and Sciences, 1860, p. 406.

Ad lapides prope Pungo Andongo leg. Soyaux teste Müll. Arg., Lich. Afr. Oec. (Linnaea 1880), p. 36.

**13. B. spuria** (Schaeff.) Arn., Fl. 1872, p. 291; Th. Fr., Lich. Scand. p. 605; Wain., Etud. Lich. Brés. I, p. 177.Var. **ferruginea** Wain.

Thallus ochraceo-pallidus aut partim etiam albidus, hydrate kalico solutionem luteam effundens, areolatus aut rimosus, levigatus, hypothallo nigricante interdum inter areolas conspicuo, medulla jodo bene caerulecente. Apothecia thallo immersa aut areolis immixta, thallum subaequantia aut demum leviter superantia, vulgo planinacula, margine tenui aut evanescente. Hypothecium fuscum. Epitheciun fuscescens. Hymenium jodo persistenter caerulecents. Spore 8na, distichae, long. 0.010 ad 0.012, crass. 0.006 ad 0.007 mm.

HUILLA.—Ad saxa arenaria in summo monte Morro de Lopollo (5600 ped. s. m.). Nos. 53 pr. p., 54 pr. p.

**Abrothallus episemoides** (Nyl.) Wain.

*Lecidea episemoides* Nyl., Lich. Angol. p. 10.

LOANDA.—Parasita supra *Tremotylium Angolense*. No. 164 pr. p. Ad fungos pertinet.

TRIB. VI.—STICTEÆ.

1. **PSEUDOCYPHELLARIA** Wain.

1. **Ps. aurata** (Ach.) Wain., Etud. Lich. Brés. I. p. 183.

*Sticta aurata* Ach., Meth. Lich. p. 277.

GOLUNGO ALTO.—Ad corticem arboris in Serra de Alta Queta parce cum specie sequente lecta. No. 91 pr. minore parte. Ster. Thallus sorediosus.

2. **Ps. clathrata** (De Not.) Wain.

GOLUNGO ALTO.—Ad corticem in corona arboris in Serra de Alta Queta. Rarissime. No. 91 pr. p. Fert. Sorediis destituta.

TRIB. VII.—HEPPIEÆ.

1. **HEPPIA** Naeg.

1. **H. congregata** Nyl. in Hue Lich. Exot. p. 125. *Endocarpiscum congregatum* Nyl., Lich. Angol. p. 14.

Thallus foliaceo-squamosus, squamis 3 ad 15 mm. longis, demum saepe dichotome repetito-laciniatus, laciniis 1 ad 3 mm. latis, superne vulgo convexis, inferne concavis (apicibus saepe planiusculis, rotundatis), prostratis aut adscendentibus, esorediatis, confertis, basin versus rhizinis paucis instructus, solidus, membranaceo-compressus. Apothecia incognita. Pycnoconidia ovoideo-oblonga, long. 0.003, crass. 0.001 mm., altero apice acuto, altero obtuso rotundatove. Sterigmata neque ramosa, nec septata. Ad sect. *Pannariellam* pertinet.

PUNGO ANDONGO (2400 ad 3800 ped. s.m.).—Ad rupes gneissaceas in summo monte Praesidii versus Caghuy. No. 242. Ad rupes arenarias prope cataractam Cachoeira de Condo fluminis Cuanza. Nos. 243, 243b. Etiam in n. 59 adest.

2. **H. Schweinfurtii** (Müll. Arg.).

*Endocarpiscum Schweinfurtii* Müll. Arg., Lich. Beitr. (1879), n. 124.

Ad saxa prope Pungo Andongo leg. Soyaux teste Müll. Arg., Lich. Afr. Occ. (Linnaea 1880), p. 40. Observante Müll. Arg. non differt a *Heterina tortuosa* Kremph., Fl. 1876, p. 57 (coll. Glaziou n. 5115).

3. **H. Mossamedana** Wain., sp. n.

Thallus areolatus vel subsquamosus, areolis rotundatis aut difformibus, circ. 1 ad 0.3 mm. latis, subintegris, dispersis, planiusculis aut convexis, olivaceo-fuscescentibus, adpressis, medio

late substrato affixis, gompho nullo distincto, rhizinis nullis. Apothecia vulgo solitaria in quavis squamula, thallo immersa, disco 0.2 ad 0.5 mm. lato, rufo, fuscescente aut pallescente, margine thallino discum et squamam leviter superante, neque distincte a thallo differente et in eam sensim continuato, instructa. Epithecium luteum. Hymenium jodo intense persistenter cerascens. Paraphyses sat arete coherentes. Ascii ventricosi, polyspori. Sporae globosae aut ellipsoideae, long. 0.003 ad 0.004, crass. 0.003 mm.

MOSAMADES (0 ad 1000 ped. s.m.).—Ad lapides calcareas in summo jugo in Serra de Montes Negros. No. 483 pr. p.

Ad sect. *Solorinariam* pertinet. Thallus homoeomerius, in lamina tenui superne aureus.

### TRIB. VIII.—COLLEMAE.

#### 1. LEPTOGIUM (Ach.) Gray.

1. **L. cæsium** (Ach.) Wain., Etud. Lich. Brés. I. p. 225.

*L. tremelloides* f. *isidiosa* Müll. Arg., Lich. Beitr. n. 374.

GOLUNGO ALTO.—Supra muscos ad corticem arboris ad Mata de Quisucula. No. 79b. Ster.

2. **L. phyllocarpum** (Pers.) Nyl.; Wain., Lc., p. 230.

GOLUNGO ALTO.—Ad corticem *Adansonia* prope Sange. No. 75b. Sporae murales.

3. **L. adpressum** Nyl., Syn. Lich. p. 131.

HUILLA.—Ad trunco vivos *Parinarii* in sylvis editis montis Morro de Lopollo 5000 ad 5600 ped. s. m. No. 1.

Sporae long. 0.060 ad 0.086, crass. 0.005 ad 0.007 mm., 7—10-septatae, fusiformes, apicibus attenuatis acutisque. Thallus adpressus, sat crassus, crebre acute rugulosus et verruculosus.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Ad *Vellasion* in rupibus editioribus Praesidii. No. 78.

Sporae 7—8-septatae, apicibus attenuatis acutisque. Paraphyses in cerebre septatae. Thallus adpressus, crassus, inaequalis, superficie cereberrime verrucosa et acute rugulosa.

#### 2. COLLEMA (Hill) Fr.

1. **C. vespertilio** (Lightf.) Wain., Etud. Lich. Brés. I. p. 235.

GOLUNGO ALTO.—Ad corticem arborum in editis (2300 ped. s. m.) supra Banca de Quilombo. No. 74. Ad trunco vetustos *Adansonia* prope Pereira. No. 76. Ad trunco vetustos juxta oras sylvae primitiae ad Quisucula. No. 77. Ad *Swietoniem* in Quibolo. No. 77b. Ad ramos emortuos in sylvis in Serra de Alto Queta. No. 80.

No. 76 ad f. *subpruinosa* Wain., disco apotheciorum tenuissime pruinoso instructam, pertinet.

#### 3. OMPHALARIA (Gir.) Mont.

1. **O. (sect. Peccania) minuscula** (Nyl.) Wain.

*Synalissa minuscula* Nyl., Lich. Angol. p. 3.

Thallus superne fruticuloso-divisus, inferne peltatus, pulvinulos circ. 1 ad 1.5 mm. latos et 0.5 mm. crassos formans, gonidia

xanthocapsoidea, membrana olivaceo-aurea gelatinosa incrassata instructa continens, ramis circ. 0.070 ad 0.140 mm. crassis, apice obtusis aut rotundatis clavatisve.

MOSSAMEDES.—Ad saxa calcarea in summo monte Serra de Montes Negros 500 ad 600 ped. s. m. No. 2 pr. p., 15 pr. p.

#### 4. PSOROTICHIA Mass.

##### 1. *Ps. fuliginella* (Nyl.) Wain.

*Collema fuliginellum* Nyl., Lich. Angol. p. 4.

Thallus gonidia olivaceo-aurea *Xanthocapsæ* continens.

MOSSAMEDES.—Ad rupes micaceo-schistosas prope Pomangula. Nos. 57, 58.

##### 2. *Ps. Gorgonina* Wain., sp. n.

Thallus tenuissimus, granulosus, dispersus, fuligineus. Apothecia facie pyrenolea, in verruculis circ. 0.2 mm. latis, elevatis, solitariis inclusa, disco punctiformi impresso. Hymenium totum decoloratum aut epithecio pallido, jodo levissime aut parum cærulescens, dein lutescens. Paraphyses parce evolutæ, haud constrictæ. Asci cylindrici aut clavati. Sporæ 8næ, monostichæ aut distichæ, simplices, globosæ, diam. 0.007 ad 0.008 mm. Gonidia xanthocapsoidea.

INS. CAPITIS VIRIDIS.—Ad rupes vulcanicas in Monte Verde in insula S. Vicenti 300 ped. s. m. No. 162.

### TRIBE IX.—LECIDÆ.

#### 1. CLADONIA (Hill) Web.

##### 1. *Cl. fimbriata* (L.) Fr.

Var. *chondroidea* Wain. f. *Balfourii* (Cromb.) Wain., Mon. Clad. Univ. ii. p. 339.

*Cl. fimbriata* var. *tenella* Müll. Arg., Lieb. Afr. Occ. (Linnaea 1880), p. 31.

Ad radices et basin arborum securis Banya in regione Loango leg. Pechuel-Loesche.

#### 2. LECIDEA (Ach.) Wain.

##### 1. *L. (Bacidia) heteroloma* Wain., sp. n.

Thallus crustaceus, subcontinuus aut rimosus, sat tenuis, verruculoso-inæqualis, glaucescenti-albidus, KHO non reagens, hypothallo saepe ad ambitum linea nigricante indicato, ex hyphis crebre contextis formato. Apothecia 0.6 ad 0.9, rarius 1.2 mm. lata, disco persistenter plano aut demum convexo, fusco-nigricante aut fusco, nudo, opaco, margine sat crasso aut mediocri, persistente, pallido aut cinerascente. Excipulum pallidum, hyphis radiantibus, pachydermatieis, cellulis elongatis, cavitate cellularum angusta. Hypothecium pallidum. Hymenium totum decoloratum (n. 149) aut epithecio cerasino-rufescente (n. 125, 148) aut parte inferiore rufescente (n. 150), jodo persistenter cærulescens. Paraphyses arcte cohærentes, filiformes. Sporæ 8næ, aciculares

(n. 125, 148, 149) et apice inferiore attenuata aut bacillares (n. 150) et apicibus obtusis, circ. 5-9-septatae, long. circ. 0.036 ad 0.056 (in n. 150: 0.017 ad 0.028) mm, crass. 0.002 ad 0.035 mm. Habitu similis est *L. Sitiana* Wain., Lich. Bras. Exs. n. 813, et *L. ochrocheila* Wain., *i.e.*, n. 860, at sporis tenuioribus a priore et hypothecio pallido a posteriore differens. *L. heterochroa* (Müll. Arg., Lich. Beitr. n. 203) thallo obscuriore et apothecis pallidi-  
oribus ab ea distinguitur.

Var. **elongata** Wain.

Apothecia margine cinerascente aut cinereo-pallescente. Spore aciculares, apice inferiore attenuata, long. 0.036 ad 0.056, crass. 0.002 ad 0.003 mm.

**GOLUNGO ALTO** (1000 ad 2400 ped. s. m.).—Ad corticem arborum (*Cordia*) in sylvis primevis densioribus prope Sange. Nos. **125, 148, 149** pr. p.

Var. **bacteriospora** Wain.

Apothecia margine pallido. Hymenium circ. 0.055 ad 0.060 mm, crassum, majore parte inferiore rufescens, epithecio decolorato. Spore bacillares, apicibus obtusis aut aciculares et altero apice attenuata, pluriseptatae, long. 0.017 ad 0.028, crass. 0.003 ad 0.035 mm.

**GOLUNGO ALTO** (1000 ad 2400 ped. s. m.).—Ad trunco juniores in sylvis primevis in Serra de Alta Queta. No. **150**.

2. **L. byssothallina** Wain., sp. n.

Thallus verruculosus aut verruculoso-inaequalis, glaucescenti-albidus, KHO flavescentia, hypothallo bene evoluto, byssoido, ex hyphis laxe contextis formato, albido aut (praesertim ad ambitum) fuscescente. Apothecia 0.8 ad 1 mm, lata, disco demum convexo, livido-nigricante aut fusco-nigricante, nudo, opaco, margine mediocri, persistente, livido-pallescente. Excipulum pallidum aut rufescens aut solum extus rufescens, ex hyphis radiantibus, modice pachydermatieis formatum, cellulis oblongis, sat angustis. KHO non reagens. Hypothecium rufescens, KHO non reagens. Hymenium circ. 0.100 ad 0.070 mm, crassum, jodo caeruleo, dein obscure vino-rubens. Epithecium fuscescens, KHO non reagens. Paraphyses arete cohaerentes, 0.0015 mm, crassae, apicibus leviter aut parum incrassatis. Spore 8-m, aciculares, apice inferiore attenuata, altero apice obtuso, circ. 7- ad 8-septatae, long. 0.042 ad 0.058, crass. 0.0035 ad 0.004 mm.

**GOLUNGO ALTO**.—Ad trunco arborum in sylvis primevis humili-  
oribus summi jugi montis Cungulungolo. No. **177**.

3. **L. Golungensis** Wain., sp. n.

Thallus crustaceus, subcontinuus, tenuis aut sat tenuis, verru-  
culosio-inaequalis, sepe parce etiam granulosus, glaucescentia, KHO non reagens, hypothallo indistincto aut ad ambitum linea fusces-  
cente indicata, ex hyphis cerebre contextis formato. Apothecia 0.5 ad 1 mm, lata, disco demum vulgo convexo, rufo aut testaceo-  
rufescente, nudo, opaco, margine tenui, disco concolore obscurioreve.

rufescente aut fuscescente, demum vulgo excluso. Excipulum pallidum aut in margine intus rufescens, hyphis radiantibus, cellulis angustis, oblongis. Hypothecium pallidum. Epitheciun decoloratum. Hymenium jodo persistenter caerulescens. Sporae 8næ, rectæ, bacillares aut aciculares, 3-6-septatae, long. 0.026 ad 0.042, crass. 0.002 ad 0.003 mm. Paraphyses tenues, filiformes, simplices aut raro parce connexæ, sat arte cohaerentes.

Var. *pluriseptata* Wain.

Sporæ apicibus obtusis aut apice inferiore attenuato, circ. 4- ad 6-septatae, long. 0.038 ad 0.042 mm. Hymenium circ. 0.060 ad 0.070 mm. crassum.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos vigentes *Cordia* in sylvis primævis densioribus prope Sange. No. 149 pr. p. Ad truncos vigentes in sylvis in Serra de Alta Queta. No. 154.

Var. *pauciseptata* Wain.

Sporæ apice inferiore attenuato, 3-septatae, long. 0.026 to 0.036, crass. 0.0025 to 0.003 mm. Hymenium circ. 0.055 to 0.065 mm. crassum.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos arborum juniorum in sylvis prope Sange. Nos. 135<sup>a</sup>, 136. Ad truncos arborum in sylvis primævis in Serra de Alta Queta. Nos. 150<sup>c</sup>, 151.

4. *L. laurocerasi* (Del.) Wain.

*Patellaria laurocerasi* Del. in Dub. Bot. Gall. p. 653. *Lecidea endoleuca* Nyl. in Hue, Lich. Exot. p. 201; Malme, Bot. Not. 1895, p. 209.

Var. *amylothelia* Wain.

Hymenium jodo persistenter caerulescens. Apothecia atra, margine concolore aut primo sèpe cinereo-nigricante. Epitheciun cerasino-fuscescens, KHO pururascens. Paraphyses paulum connexæ, apice clavatae, in KHO sat laxæ. Hypothecium pallidum. Excipulum pallidum, in margine cerasino-fuscescens. Sporæ long. 0.046 ad 0.054, crass. 0.002 ad 0.003 mm.

GOLUNGO ALTO.—Ad truncos juniores in sylvis prope Sange. No. 184.

5. *L. medialis* Tuck. in Wright, Lich. Cub. n. 203; Wain., Etud. Lich. Brés. II. p. 17.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos arborum juniorum in sylvis prope Sange. No. 134.

6. *L. (Bilimbia) farinulenta* (Müll. Arg.).

*Patellaria farinulenta* Müll. Arg., Lich. Afr. Occ. (Linnæa 1880), p. 36.

In foliis coriaceis in planicie depressa secus flum. Quilla leg. Pechuel-Loesche teste Müll. Arg., *l.c.*

7. *L. sublecanorina* (Nyl.) Wain.

*Platygrypha sublecanorina* Nyl., Lich. Angl. p. 13.

Thallus flavid-glaucescens vel stramineo-glaucescens, gonidiis cytococcoideis instructus. Apothecia 0.2 ad 0.3 mm. lata, orbicularia, disco fusconigro, plano, opaco, nudo, margine tenui, integro,

albido, gonidiis destituto. Hypothecium fuscescens aut fusco-rufescens. Excipulum subtus et in parte marginali interiori fuscescens, ex hyphis conglutinatis formatum, in parte marginali exteriori glaucescens aut albido, ex hyphis irregulariter cerebro contextis conglutinatis aut subconglutinatis tenuibus formatum, inferne clausum, strato thallino gonidiifero impositum. Hymenium jodo persistenter caeruleo-scens. Epithecum tenuiter fuscescens. Paraphyses incerebre ramoso-connexae, apice cerebris ramosae connexaeque. Spore oblongo- vel ovoideo-fusiformes, apicibus obtusis, long. vulgo 0.015, crass. 0.001 mm. Conceptacula pycnoconidiorum pallida. Sterigmata brevia, pauci-articulata, ramosa. Pyrenoconidia lageniformia vel pyriformi-oblonga, long. 0.005 ad 0.008, crass. 0.015 mm., apice angustiore sterigmatibus affixa.

GOLUNGO ALTO. Ad folia *Eugenia uniflora* (Pitangueira) culta prope Sange. No. 308. Ad folia arboris semperfurentis in sylvis primevis in Sobato Bango-Aquitamba. No. 315. Ad folia Sapindacearum prope Capopa. No. 304 pr. p.

#### 8. *L. exiguella* Wain., sp. n.

Aflinis et subsimilis est *L. subleucorina*, a qua colore thalli et thallo tenuiore, apotheciis minoribus, tenuioribus, margine cinerascente tenuioreque distinguitur. Thallus tenuissimus, continuus, viridis, opacus, gonidiis globosis, simplicibus, cystococcoides, diam. circ. 0.010 ad 0.006 mm. Apothecia, 0.15 ad 0.20 mm. lata, orbicularia aut denum angulosa, disco fusconigro, plano, opaco, nudo, margine tenui, integro, cinerascente aut sordide albicante, gonidiis destituto. Hypothecium rufescens. Excipulum testaceo-rufescens, ex hyphis irregulariter cerebro contextis, subconglutinatis, tenuibus formatum, strato obscurato rufescenteve gonidia parce continentis thalli impositum. Hymenium circ. 0.060 mm. crassum, jodo persistenter caeruleo-scens. Epithecum testaceo-rufescens. Ascii clavati aut pyriformes, long. circ. 0.040, crass. 0.012 ad 0.018 mm., apice membrana leviter incrassata. Paraphyses sat parce evolutae, leviter ramoso-connexae. Spore sphaer. polystichae, decoloris, oblongae aut ovoido-oblongae, rectae aut rarius leviter curvatae, 3-septatae, haud constrictae, long. 0.011 ad 0.014, crass. 0.003 ad 0.004 mm., apicibus obtusis aut rotundatis. Conceptacula pycnoconidiorum testacea. Sterigmata brevia (0.004 ad 0.003 mm.), subsimplicia, apicibus pycnoconidia effrentibus. Pyrenoconidia pyriformi-oblonga, long. 0.003 ad 0.004, crass. 0.0015 mm., recta, apice angustiore sterigmatibus affixa.

GOLUNGO ALTO. Ad folia *Ficus ureolaris* Welw. (cf. No. 6336) in silva primitiva ad Quismenlo una cum *Stigula atroviridis*, *Str. hypothelia*, *Str. Africana* et *Asterothelium Welwitschii*. No. 288 pr. p.

Habitu *Rinodinum exiguum* in memoriam revocat.

#### 9. *L. (Lopadium) olivaceum* (Müll. Arg.) Wain.

*Lopadium olivaceum* Müll. Arg., Lich. Beitr. (Flora 1881), n. 271, Lich. Epiphyll. (1890), p. 15.

Thallus tenuissimus, laevigatus, glaucescens, gonidiis cystococ-

coideis instructus. Apothecia 0·4 ad 0·35 mm. lata, fuscescens aut testaceo-fuscescens, planiuscula, margine tenuissimo concolore. Excipulum pallidum, pseudoparenchymaticum, cellulis minutissimis, inferne anguste cyanescens. Hypothecium pallidum, inferne testaceum, KHO non reagens. Hymenium totum decoloratum, jodo persistenter cærulescens. Paraphyses parcissime ramoso-connexæ, maxima parte simplices. Sporæ solitariae, demum pallidæ, murales, cellulis numerosissimis, halone nullo, long. 0·060 ad 0·073, crass. 0·020 ad 0·024 mm. Colore hypothecii et basis excipuli paulum a *L. olivacea* (Müll. Arg.) differt, quare nuncupetur var. *alsodinea* Wain.

GOLUNGO ALTO.—Ad folia perennia Alsodinearum in sylvis editioribus densis in Alta Queta. No. 311.

10. **L. (Bombyliospora) Domingensis** (Pers.) Nyl.

GOLUNGO ALTO.—Ad corticem arboris Artocarpeæ in sylvis primævis in Alta Queta. Nos. 167, 168.

11. **L. (Psora) placodina** Nyl., Lich. Angol. p. 9.

Affinis est *L. (Psora) conglomerata* (Koerb.), neque ad stirpem *L. parasemina* pertinet (ut censem Nylander).

MOSSAMEDES.—Ad lapides quartzosos in alta planitie inter Caroca et Cazimba cum *Welwitschia mirabilis*. No. 49.

12. **L. (Biatora) russula** Ach.

HUILLA (3800 ad 5500 ped. s. m.).—Ad truncos *Parinarii* et ad ramulos fruticum in sylvis editis in Morro de Lopollo. Nos. 37, 39, 40.

13. **L. cinereorubra** Wain., sp. n.

Thallus crustaceus, sat tenuis, subcontinuus, verruculosoinæqualis, esorediatus, cinereo-glaucescens aut sordide albicans, KHO flavescens, hypothallo indistincto. Apothecia 0·4 ad 0·8 mm. lata, adpressa, sordide vel obscure coccinea, nuda, jam primitus immarginata convexaque. Hypothecium pallido-rubescens vel fulvo-rubescens, KHO non reagens. Hymenium dilute fulvescens, jodo persistenter cærulescens. Epithecum rubescens, KHO violaceens. Paraphyses arcte cohærentes. Ascæ clavati. Sporæ 8næ, distichæ, ellipsoideæ vel oblongæ, apicibus obtusis, long. 0·008 ad 0·009, crass. 0·004 mm., simplices, decolores. Affinis est *L. cinnabarina* Sommerf., a qua thallo esorediato obscurioreque, apotheciis paullo obscurioribus et hypothecio fulvescente differt. Etiam *L. cinnabarodes* Nyl., *L. griseococcinea* Nyl. et *L. russulina* Müll. Arg. (Lich. Beitr. n. 431) ab ea differunt.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos juniores in sylvis editis in Serra de Alta Queta. No. 150b.

14. **L. subsimilis** Nyl., Prodr. Fl. Nov.-Gran. ed. 2 (1863), p. 347 (Lich. Nov. Zel. p. 81). *L. tenuis* Müll. Arg., Lich. Afr. Occ. (Linnaea 1880), p. 34 (Lich. Beitr., 1882, n. 507).

Ad ramos in planitie seclusis flumen Quillu legit Pechuel-Loesche teste Müll., l.c.

15. **L. gyalectoides** Wain., sp. n.

Thallus crustaceus, tenuis aut mediocris, subcontinuus, verruculoso-inequalis, esorediatus, cinereo-glaucescens, KHO non reagens, hypothallo indistincto. Apothecia 1 ad 0.5 mm. lata, adpressa, disco persistenter plano aut demum depresso-convexo, pallido aut rarius testaceo, nudo, margine concolor aut pallidior, tenui, persistente aut demum subexcluso. Excipulum pallidum aut passim testaceum. Hypothecium pallidum. Hymenium jodo persistenter caerulescens. Epitheciun aut hymenium totum pallidum. Paraphyses areto cohaerentes, 0.0015 mm. crassae, simplices, apice haud incrassatæ. Ascii clavati. Sporae 8næ, distichæ, oblongæ, apicibus obtusis, simplices, decolores, long. 0.009 ad 0.014 (ad 0.017), crass. 0.001 ad 0.005 mm. Habitu subsimilis est *Gyalecta lutea*. Aflinis est *L. vernali*, a qua apotheciis tenuioribus et reactione hymenii differt. *L. cinereo-lutescens* Nyl. apotheciis minoribus et sporis crassioribus recedit. Aflines etiam sunt *L. subpineti* Krempehl., *L. carneocallens* Nyl., *L. subsimilis* Nyl., *L. pallens* Müll. Arg. (Lich. Beitr. n. 1505) et *L. Puiggarii* Müll. Arg. (Lich. Beitr. n. 346, haud Nyl., Lich. Fueg. p. 34).

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad trunco vigentes in sylvis inter Sange et Camilungo. No. 126. Ad trunco vigentes in sylvis primevis densioribus in Serra de Alta Queta. No. 146. Ad trunco vetustos *Cordia* in sylvis primevis prope Bango-Aquitamba. No. 152.

16. **L. Capopensis** Wain., sp. n.

Thallus crustaceus, sat tenuis, sat continuus aut rimosus, superficie verruculoso-inequali et leviter granulosa, cinereo-glaucescens, KHO non reagens, hypothallo albido, parum distincto. Apothecia 0.7 ad 1 mm. lata, adpressa, disco persistenter planiuscule aut demum convexo, testaceo, nudo aut subnudo, margine tenui, vulgo fuscescente, vulgo persistente. Excipulum pallidum aut partim in margine extus anguste rufescens, cellulis minutis. Hypothecium albido. Hymenium totum decoloratum aut epithecio pallido, jodo persistenter caerulescens. Paraphyses areto cohaerentes. Sporae 8næ, monostichæ aut distichæ, simplices, decolores, ellipsoideæ, long. 0.008 ad 0.012, crass. 0.005 ad 0.007 mm. Habitu subsimilis *L. luridescens* Nyl. et *L. piperis* (Spreng.) est, at colore hypothecii ab iis differens. *L. testaceoglaucia* Wain., Etud. Lich. Brés. II. p. 52, ei magis est affinis, at margine et sporis ab ea recedit.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad trunco vigentes in sylvis editoribus in Capopa agri Sangensis. No. 127.

17. **L. nigricans** Wain., sp. n.

Thallus crustaceus, sat tenuis, subcontinuus aut rimosus, superficie verruculoso-inequali et leviter granulosa, glaucescens aut albido-cinerascens, KHO non reagens, hypothallo albido aut nigricante tenui limitatus. Apothecia 0.7 ad 1 mm. lata, adpressa, disco persistenter planiuscule aut demum depresso-convexo, nigri-

cante, nudo, opaco, margine tenui, disco concolore, persistente. Excipulum dilute pallidum, in margine extus violaceo-rufescens. Hypothecium pallidum. Hymenium jodo persistenter cærulescens. Epitheciun violaceo-rufescens. Paraphyses arcte cohaerentes, tenues, haud connexæ. Ascii clavati. Sporæ 8næ, distichæ, simplices, decolores, ellipsoideæ, long. 0.009 ad 0.013, crass. 0.006 ad 0.007 mm. Afinis praecedenti.

GOLUNGO ALTO.—Ad truncos arboris Artocarpeæ in sylvis primitivis prope Sange. No. 172b.

18. **L. canorubella** Wain., Etud. Lich. Brés. II. p. 51.

Hypothecium fusco-fuligineum. Excipulum extus pallidum. Apothecia sordide fusco-testacea, margine fere concolore. Sporæ long. 0.009 ad 0.012, crass. 0.005 ad 0.008 mm.

GOLUNGO ALTO.—Ad corticem arboris Artocarpeæ in sylvis prope Sange. No. 171.

19. **L. caliginosa** Stirt. *L. fuscorubescens* Nyl., Lich. Andam. (1874), p. 10; Cromb., Lich. Chall. p. 216, haud Nyl., Lich. Port-Nat. (1868), p. 8.

Var. **rhacocarpa** Wain. Apothecia aggregato-prolifera aut ambitu lobata aut pro minore parte simplicia, 0.5 ad 1.2 mm. lata, disco testaceo, plano aut convexiusculo, margine tenui, nigricante, persistente. Hypothecium fusco-fuligineum, excipulum extus pallidum. Hymenium totum decoloratum, jodo persistenter cærulescens. Paraphyses arcte cohaerentes, in KHO sat laxæ, haud connexæ. Sporæ 8næ, distichæ, simplices, decolores, long. 0.009 ad 0.012, crass. 0.006 ad 0.008 mm. Thallus sat tenuis aut mediocris, rimulosus, superficie leviter inæquali, parcissime granulosa, glaucescens, hypothallo crebre contexto nigricante angusto passim limitatus.

GOLUNGO ALTO.—Ad truncos *Diospyri* in Serra de Alta Queta. No. 170.

20. **L. granifera** Ach., Syn. Lich. (1814), p. 163 (secund. herb. Ach.). *L. aurigera* Fée, Ess. Crypt. Ecore. (1824), p. 106, Wain., Etud. Lich. Brés. II. p. 54.

Var. **lecanoroides** Wain. Verrucæ thalli intus stramineo-albidæ. Apothecia disco nigricante aut fusco, margine albido aut cinereo-albicante, integro.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos vigentes in sylvis primævis in Serra de Alta Queta (No. 145), et inter Sange et Trombeta (No. 155).

Var. **leucotropoides** Wain. Verrucæ thalli intus stramineo-albidæ. Apothecia disco testaceo, margine albido aut cinerascente aut circa hymenium nigro, subintegro.

SIERRA LEONE.—Ad truncos arborum (*Spomalias*) prope Freetown. No. 166.

21. **L. Mossamedana** Wain., sp. n.

Thallus crustaceus, sat tenuis aut mediocris, verruculis circ. 0.2 mm. latis aut parcis etiam verrucis areolisive irregularibus

dispersis aut rarius subcontiguis, hypothallo albido et ad ambitum anguste caeruleo-nigricante, neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens. Apothecia 0.7 ad 1.6 mm. lata, adpressa, convexa, disco nigricante, tenuissime pruinoso, margine tenuissimo nigro aut pruinoso demum evanescente. Excipulum nigricans, KHO non reagens. Hypothecium pallidum aut dilute fuscescens. Hymenium superius caerulescens, epithecio fuligineo, KHO non reagente, jodo caerulescens, demum obscuratum aut ascis partim obscure vino-rubentibus, materiam oleosam abundanter continens. Paraphyses arete cohaerentes, mediocre, haud connexae. Ascii clavati. Sporae 8nae, distichae, decolores, simplices, subglobosae vel ellipsoideo-globosae, long. 0.008 ad 0.009, crass. 0.007 ad 0.0065 mm. Pyrenoconidia ellipsoidea, long. 0.003, crass. 0.0015 mm. Sterigmate pauciarticulata, brevia, apicibus abrupte attenuatis. Inter *Biatoras* et *Eulecidea* est intermedia.

MOSSAMEDES.—Ad lapides calcareas in Serra de Montes Negros 500 ad 600 ped. s. m. Nos. 13, 15 pr. p.

22. **L. Sangeana** Wain., sp. n.

Thallus crustaceus, tenuis, verruculoso-inequalis, esorediatus, albidus, KHO non reagens, hypothallo indistincto aut passim ad ambitum linea nigricante indicatus. Apothecia 0.5 ad 0.4 mm. lata, adpressa, disco atro aut fuscato-atro aut pr. p. livido, nudo, piano aut planiusculo, margine tenui, atro, persistente, subintegro aut flexuoso. Excipulum et hypothecium fuscо-fuligineum, KHO non reagens. Hymenium circ. 0.045 mm. crassum, jodo persistenter caerulescens. Epithecium dilute fuscescens aut rarius decoloratum, KHO non reagens. Paraphyses arete cohaerentes, haud ramosae, tenues, apice clavatae. Ascii clavati. Sporae 8nae, distichae, decolores, simplices, fusiformes aut ellipsoidea, long. 0.007 ad 0.015, crass. 0.003 ad 0.005 mm. *L. myriocarpoidea* Nyl. in memoriam revocat. Inter *Biatoras* et *Eulecidea* est intermedia.

GOLANGO ALTO.—Ad arbores juniores Artocarpeas in sylvis prope Sange. Nos. 172, 173.

23. **L. (Eulecidea) lithagogia** (Nyl.) Wain.

*Lecauora lithayoga* Nyl., Lich. Angol. p. 7.

Thallus crassus (cire. 0.5 ad 0.7 mm.), areolas cire. 2 ad 1 mm. latae, ambitu crenulatas vel lobulatas, convexas aut rarius in crustam continuam confluentes formans, strato corticali cartilagineo verrucas convexas aut planiusculas aut rarius isidioideo-elevatas semipellucidas cimento thallino gonidia continente albido conglutinatas formante instructus, KHO levissime flavescentes. Medulla jodo non reagens. Apothecia thallo immersa, excipulo fuscо-fuligineo basi deficiente. Hypothecium pallidum. Hymenium superius dilute fuscescens, KHO sordide violaceens. Paraphyses haud connexae. Ad species inter *Eulecidea* et *Aspicilia* intermedias pertinet et affinis est *L. buelliana* Müll. Arg.

MOSSAMEDES.—Ad lapides calcareas in Serra de Montes Negros 500 ped. s. m. Nos. 16, 51 pr. p.

24. **L. Angolensis** Müll. Arg., Lich. Afr. Occ. (Liunæa 1880), p. 35, Lich. Yatab. Jap. (Nuov. Giorn. Bot. Ital. 1892), p. 197; Steiner, Flecht. Brit.-Ostafr. (1897), p. 223.

Ad lapides prope Pungo Andongo in Angola lecta a Soyaux teste Müll., *l.c.*

25. **L. leptobola** Nyl., Lich. Angol. p. 10.

HUILLA.—Ad lapides arenarios in Serra de Lopolo teste Nyl., *l.c.*

#### TRIB. X.—ACAROSPOREÆ.

##### 1. **ACAROSPORA** (Mass.) Wain.

1. **A. teresa** (Fr.) Steiner, Flecht. Brit.-Ostafr. (1897), p. 219.

*Purmelia chlorophhana* f. *teresa* Fr., Lich. Eur. Ref. (1831), p. 118. *Lecanora hilaris* Zwackh., Lich. Exs. n. 973.

Var. *thæodes* (Mass.) Wain.

*Acarospora thæodes* Mass., Lich. Cap. (1861), p. 55. *Placodium thæodes* Müll. Arg., Lich. Beitr. n. 119. *Lecanora thæodes* Stizenb., Lich. Afr. p. 130. *Lecanora xanthophhana* Nyl., Lich. Angol. p. 8 (= *L. bella* Nyl., Add. Crypt. Chil. 1855, p. 156); conf. autem Müll. Arg., Lich. Beitr. n. 119, 1414, Lich. Austr. Occ. p. 194.

Thallus areolis plus minusve dispersis, crassioribus.

MOSSAMEDES.—Ad lapides 500 ad 600 ped. s. m. in Serra de Montes Negros. Nos. 19, 44.

PUNGO ANDONGO (2400 ad 3800 ped. s. m.).—Frequenter in rupibus in monte Pedra Cazella. No. 56. Etiam a Soyaux in Pungo Andongo lecta (Müll. Arg., Lich. Afr. Occ. p. 33).

Var. *tenuis* Wain.

*Lecanora teresa* Nyl., Lich. Angol. p. 8.

Thallus tenuis, areolis contiguis aut dispersis.

MOSSAMEDES.—Ad rupes schistosas verticales inter Maiombo et Cazimba in via ad Huillam. Nos. 17 pr. p., 18, 160 pr. p. Ad rupes, schistosas in Serra de Cazimba inter Maiombo et Pomangula. No. 485 pr. p.

2. **A. fuscata** (Schrad.) Arn. \***A. discreta** (Ach.) Th. Fr., Lich. Scand. p. 217.

MOSSAMEDES.—Ad rupes schistosas inter Maiombo et Cazimba. No. 160 pr. p. Sine apotheciis, at cum pycnoconidiis. Pycnoconidia oblongo-ovoidea, long. 0'002 ad 0'003, crass. 0'001 mm., altero apice attenuato.

#### TRIB. XI.—CŒNOGONIEÆ.

##### 1. **CŒNOGONIUM** Ehrenb.

1. **C. subvirescens** Nyl., Fl. 1874, p. 72; Wain., Etud. Lich. Brés. II, p. 66.

GOLUNGO ALTO.—Ad trunco et ramulos arborum in Serra de Alta Queta. No. 259. Ster. Cellulæ gonidiorum (Trentepohliae) long. 0'012 ad 0'022, crass. 0'008 ad 0'010 mm. In n. 169, 256, 257 et 258 in statum thallo pannose expanso instructum transit, qui thallo similis est *C. implexo* Nyl., Obs. Cœnog. p. 92, at solum sterilis adest, quare certe determinari non potest. Cellulæ gonidiorum long. 0'010 ad 0'028, crass. 0'008 ad 0'012 mm.

## TRIB. XII. GYALECTEA.

## 1. GYALECTA (Ach.) Wain.

1. *G. plurilocularis* Wain., sp. n.

Thallus tenuis aut sat tenuis, continuus, verruculoso-inepiplatis, cinerascens vel glaucescens, KHO non reagens. Apothecia immata, demum elevata, 0·8 ad 0·6 mm. lata, disco plano, rarius demum convexiusculo, pallido, margine albido, primum extus minime verruculoso-crenulato, demum subintegro, primum elevato, demum discum aequante, tenui. Perithecium parenchymatico-chondroideum, cellulis minutis, brevibus, sat pachydermaticis, amplithecio thallino, paree gonidia continente, verruculoso, parum evoluto. Hypothecium decoloratum. Hymenium totum decoloratum, circ. 0·070 mm. crassum, jodo glaucescens. Paraphyses laxe coherentes, apice parum incrassatae. Ascii clavati. Spore 8næ polystichæ, fusiformes, apicibus aenatis, long. 0·018 ad 0·030, crass. 0·003 mm., 4-7-septatae. Gonidia chroolepidea, cellulis 0·006 ad 0·010 mm. crassis. Atlinis est *G. myriadella* (Nyl.), *G. glabella* (Krempehl.), *G. dericata* (Nyl.) et *G. aciculata* Auzi.

GOLUNGO ALTO (1000 ad 2400 ped. s. m.).—Ad truncos arborum in sylva. No. 128.

2. *G. epiphylla* Müll. Arg., Lich. Beitr. (1881), n. 258.

Gonidia phycopeltidea. Hymenium circ. 0·010 mm. crassum, jodo leviter vino-rubens (hanc carulescens). Paraphyses arete coherentes, apice parum incrassatae. Ascii clavati. Spore 8næ distichæ, ovoideo-fusiformes, long. 0·010 ad 0·011, crass. 0·003 ad 0·004 mm. Exeipulum e cellulis minutissimis parenchymaticis formatum.

GOLUNGO ALTO.—Ad folia *Gentianæ* in sylvis densissimis in Alta Queta. No. 316 pr. p.

## TRIB. XIII.—ECTOLECHIEA.

## 1. ECTOLECHIA Trev.

1. *E. (Gonothecium) microplaca* Wain., sp. n.

Thallus plagulas circ. 1 ad 1·5 mm. latae, rotundatae, ambitu subintegras, tenues, cinereo-albidas, cibre contextas, levigatas, nitidulas, continuas, apothecia 1 ad 4 continentis formans, cortice ex hyphis in ambitum radiantibus, 0·005 mm. crassis, leptodermaticis, breviter cellulosis, conglutinatis constituto, hypothallo nullo. Apothecia thallo immersa, margine tenui, fuscescente aut albido, habitu quasi proprio, thallum leviter superante, extus sensim in thallum dilatato. Margo sub microscopeo superne visus discum versus est laceratus, ex hyphis radiantibus strati corticalis thalli formatus. Discus circ. 0·2 ad 0·3 mm. latus, planus, thallum subaequans, livido-glaucescens aut testaceo-fuscescens. Hypothecium pallidum vel albidum, tenui, substrato impositum. Hymenium circ. 0·060 mm. crassum, jodo lutescens, sporis jodo subrubentibus.

Epithecum gonidia hymenialia (diam. 0.004 ad 0.003 mm.) continens, flavescenti-pallidum vel olivaceo-flavescens, KHO non reagens, jodo fulvo-rubescens. Paraphyses arete coherentia, neque ramosae, nec connexae. Spore solitaria, oblonga, decolores, long. circ. 0.050 ad 0.054, crass. 0.014 ad 0.022 mm., murales, cellulis numerosissimis. Thallus intus jodo vino rubens, gonidia cystococcoidea, diam. 0.007 ad 0.010 mm. continens. Excipulum in margine tenui. Afinis est *E. phyllocharide* (Mont.), quae apotheciis magis elevatis et excipulo magis evoluto ab ea differt et intermedia est inter *E. glaucoirescentem* et *E. phyllocharideum*.

GOLUNGO ALTO.—Ad folia arboris in Serra de Alta Queta. No. 290.

2. *E. (Gyalectidium) aspidota* Wain., sp. n.

Thallus plagulaeformis, fere sicut in *Strigula*, plagulas circ. 1 ad 2 mm. latas, rotundatas, ambitu subintegras, leviter depresso-convexas, albidas vel cinereo-albidas, cerebre contextas, levigatas, nitidulas, continuas, apothecia subsolitaria continentia formans, hypothallo indistincto. Apothecia thallo ureolato-immersa, aspicilioidea, immarginata, disco 0.4 ad 0.6 mm. lato, plano, impresso, testaceo-fuscescente, strato thallino gonidiis destituto imposita. Excipulum solum ex hypothecio albido gonidiis destituto tenui formatum. Hymenium 0.050 ad 0.070 mm. crassum (in KHO bene turgescens, ad 0.120 mm. crassum), jodo lutescens, epiplasmate ascorum jodo vino rubente. Epithecum dilute fuscescens aut pallidum. Paraphyses tenuissimae, gelatinam in KHO turgescen tem percurrentes, increbre ramoso-connexae. Spore solitaria, decolores, murales, cellulis numerosissimis, long. 0.030 ad 0.070, crass. 0.018 ad 0.050 mm. Gonidia cystococcoidea. Habitu sicut praecedens, sed thallo crassiore ab ea differens.

GOLUNGO ALTO.—Ad folia perennia fruticis prope Sange. No. 292 pr. p.

2. *ASTEROTHYRIUM* Müll. Arg.

1. *A. Welwitschii* Wain., sp. n.

Thallus crustaceus, tenuis, levigatus, sat opacus, continuus, albidus, maculas 1 ad 2 mm. latas formans, hyphis radiantibus (ad instar cellularum *Phycopeltidis*), pachydermaticis, circ. 0.004 mm. crassis, in cellulas breves divisus, obductus. Gonidia globosa, diam. 0.006 ad 0.010 mm., simplicia, cystococcoidea. Apothecia thallo immersa, circ. 0.250 mm. lata, 0.120 mm. crassa, orbicularia, lobis minutis, triangularibus, vulgo circ. 4, diu plus minusve distinctis, 0.025 mm. crassis, demum indistinctis, e lateribus coninventibus discoque connatis peritheciis formatis instructa. Peritheciu m testaceum, gonidiis destitutum aut in latere basali parce gonidia continens. Hypothecium tenui, testaceum, strato nullo gonidia continentis impositum. Hymenium 0.110 mm. crassum, pallidum, jodo non reagens, epithecio rufescenti-pallido. Paraphyses simplices (haud ramoso-connexae), gelatinam sat copiosam percurrentes. Asci membrana tenui. Spore bina, 1-septatae, ellipsoideae aut oblongae, long. 0.042 ad 0.048, crass. 0.018 ad 0.024 mm., haud constrictae, decolores aut pallide, membrana

0.002 mm. crassa, haud gelatinosa. Habitu *Ectolechia* in memoriam revocat et iis sine dubio affine.

GOLUNGO ALTO.—Ad folia *Fici ureolaris* Welw. in silva primitiva prope Quisueno una cum *Stigelia hypothelia*, *St. Atrovirens*, *St. atroviridis* et *Licidium exiguum*. No. 288 pr. p.

#### TRIB. XIV.—THELOTREMEÆ.

##### 1. THELOTREMA (Ach.) Eschw.

###### 1. Th. (Leptotrema) Loandense Wain., sp. n.

Thallus sat tenuis aut medioeris, sat levigatus, stramineo-albicans vel stramineo-glaucescens, subopacus, KHO levissime flavescens, dein rubescens. Excipulum haud aut parum elevatum, ostiolo parvo rotundato, margine ostiolari integro, tenui, vulgo tenuissime circumseissa. Apothecia cerebra, partim in lineas disposita, disco punctiformi, obscurato. Peritheciun pallidum, sat tenue, jodo vinose rubens, ad basin in latere zona angusta jodo caerulecente, columella nulla. Sporae 8nae, pallide et demum morbose fuscescentes, murales, septis transversalibus 5 ad 7, cellulis haud numerosis, long. 0.025 ad 0.027, crass. 0.011 ad 0.014 mm., jodo leviter violaceo-rubentes.

LOANDA (0 ad 1000 ped. s. m.).—Ad ramos *Sterculia* prope Teba. No. 441.

###### 2. Th. (Brassia) Pechueli Müll. Arg., Lich. Afr. Oec. p. 31.

Ad ramos in depressitate secus flumen Quillu lecta a D<sup>r</sup> Pechuel Loesche.

###### 3. Th. (Ocellularia) emersellum (Müll. Arg.) Wain.

*Ocellularia emersella* Müll. Arg., Thelotr. Kew. (1895), p. 153. *Th. schizostomum* Krempelh. Fl. 1876, p. 222 (Wain., Etud. Lich Brés. II, p. 84), haud Tuck., Obs. Lich. (1862), p. 111.

Peritheciun annulare, fulvescens, in KHO obscurius coloratum, columella fusca, circ. 0.120 mm. crassa. Epitheciun decoloratum. Sporae 8nae, distichæ, decolores, fusiformes, 3- ad 5-septatae, long. 0.014 ad 0.018, crass. 0.006 ad 0.007 mm.

GOLUNGO ALTO.—Ad truncoes cariosos prostratos in sylvis primævis in Mata de Quisueulo prope Bango. No. 203.

##### 2. GYROSTOMUM Fr.

###### 1. G. seyphuliferum (Ach.) Fr.

GOLUNGO ALTO.—Ad truncoes vigentes in sylvis Leguminosarum inter Sange et Trombeta 1000 ad 2400 ped. s. m. No. 133. Ad corticem *Munodora* in summis montibus Cungulungulo. No. 224.

#### TRIB. XV.—PILOCARPEÆ.

##### 1. PILOCARPON Wain.

###### 1. P. leucoblepharum (Nyl.) Wain., Etud. Lich. Brés. II, p. 89.

GOLUNGO ALTO.—Frequenter ad folia arborum sempervirentium in sylvis prope Fonte de Capopa (ad *Chytranthum Mannii*). No. 319 pr. p.

## TRIB. XVI.—LECANACTIDÆ.

1. **LECANACTIS** (Eschw.) Wain.1. **L. (subg. *Eulecanactis*) *flava*** Wain., sp. n.

Thallus tenuis, flavescens, sat levigatus, linea hypothallina passim limitatus. Apothecia crebra, elevata, primum orbicularia, denum anguloso-rotundata, circ. 0·4 ad 0·6 mm. lata. Perithecium fuligineum, integrum. Discus apertus, planus aut denum convexiusculus, flavescens-pruinosus. Margo fuligineus, tenuis, persistens. Hypothecium fuscescens. Hymenium circ. 0·080 mm. crassum, jodo subpersistenter caerulescens, metaplasmate ascorum vinose rubente. Epithecum dilute fuscescens, parte summa flavescens, KHO non reagens. Paraphyses ramoso-connexæ, apice ramosæ. Ascæ clavati. Sporæ 8næ, ovoideo-oblongæ, apicibus obtusis aut rotundatis, 3-septatae, long. 0·015 ad 0·016, crass. 0·004 ad 0·005 mm., decolorantes, morbosæ denum nigricantes. Affinis est *L. chloroconiae* Tuck., que thallo cimereo ab ea differt.

LOANDA.—Ad ramulos fruticum (*Balsamodendron* et *Adansonia digit.*) in collinis aridis maritimis prope Boa Vista et Maianga do Povo. Nos. 186, 186<sup>b</sup>.

2. **L. (subg. *Arthoniactis*) *ostrearum*** Wain., sp. n.

Thallus indistinctus, ex hyphis tenuibus anastomosantibus formatus. Gonidia chroolepoidea, cellulis circ. 0·008 ad 0·010 mm. crassis, concatenatis (in CII visa). Apothecia crebra, parce etiam confluentia, denum elevata, orbicularia, 0·3 ad 0·6 mm. lata, basin versus sensim dilatata neque constricta, habitu acarosporoidea aut aspicilioidea. Perithecium fusco-fuligineum, basi tenui, KHO non reagens. Discus apertus, impressus, fere punctiformis, circ. 0·1 ad 0·15 mm. latus, fusco-nigricans, nudus, margine elevato-cinctus. Hypothecium fuscescens, Hymenium circ. 0·050 mm. crassum, jodo non reagens. Epithecum pallidum, KHO non reagens. Paraphyses ramoso-connexæ. Ascæ clavati, circ. 0·025 ad 0·030 mm. lati, apice membrana incrassata. Sporæ 8næ, distichæ, decolorantes, ovoideo-oblongæ, apicibus rotundatis, 1-septatae, septo in medio, halone nullo indutæ, long. 0·016 ad 0·018, crass. 0·006 ad 0·008 mm.

INSULA PRINCIPIS (in sinu Benin sub aequatore).—Ad Ostreas juxta litus Oceani prope Bahia de St. Antonio. No. 229. Subgenus *Arthoniactis* sporis 1-septatis a subg. *Eulecanactis* differt. A Müll. Arg. et aliis auctoribus species plures *Opegrapha* ad *Lecanactidem* false adducte sunt. *Lecanactidæ* vere in *Patellariis* inter fungos cyclocarpeos transeunt (vide Wain., Lich. Autill. p. 24), neque in *Hystericis*, quare ad *Graphideus* pertinere non possunt, sed tribum autonomum inter Cyclocarpeas constituant.

## B. HYSTERIEÆ.

## TRIB. 1.—ROCCELLEÆ.

Ut S. Almquist (Om. Skand. Schism. Opegr. 1869, p. 5), J. Reinke (Abhandl. Flecht. p. 158) et O. V. Darbshire (Monogr.

Roccella, p. 8) indicaverunt, *Roccella* affinitatem cum Graphideis ostendunt. Ad instar apotheciorum Graphidearum, in generibus insignibus *Reinckella* et *Ingaderia*, a Darbshire detectis, apothecia, quae auctor mihi communicavit, et quae parasitae non esse videntur, jam ab origine lirelliformia sunt. In genere *Roccella* hic character valde degeneratus est, at etiam ibi apothecia ellipsoidea irregularia cum apothecis orbicularibus observantur. In *Dirina multiflorum* Mont. (paraphysibus haud connexis a *Platygrapha* differente), ad Graphideas pertinente, apothecia item lirelliformia sunt, at in aliis speciebus hujus generis plus minusve (sed haud omnino) orbicularia. In genere *Roccellina* (Darb., *l.c.*, p. 56) evolutio thalli fruticulosi e typo crustaceo (sere sicut in *Thallidium*) observari potest. In genere *Roccella* igitur minime adsunt podetia e stipite apotheciorum evoluta, sed verus thallus fruticulosus (stroma fruticulosum) in mycelio nascens. Si in statu juvenili evolutio thalli indagatur, quo modo solo certum judicium de natura morphologica membrorum plantae haberi potest, observatur hoc mycelium vel protothallium *Roccella* post evolutionem stromatis fruticulosi non deperire, sed hyphis e stromate fruticuloso excrescentibus auctum, in placentam, mycelio subsimilem aut in pluribus speciebus etiam stroma crustaceum parvum corticatum gonidiiferumque formantem, evolvi. Haec placenta igitur morphologice neque est analoga thallo primario *Cladoniacearum*, nec omnino hypothallo fruticuloso *Cladoniacearum*, e basi podetiorum exerescenti, morphologice respondet, etiam aliam structuram anatomicam et aliam staturam habens, et cum ob causam alio nomine designanda est. Placenta *Roccellarum*, sicut hypothallus *Cladoniacearum* (conf. Wain., Monogr. Clad. III, p. 8), etiam novos thallos producere potest.

## 1. ROCCELLA Ach.

1. **R. tinctoria** DC., Fl. Fr. 3, ed. ii, p. 331; Ach., Lich. Univ. p. 439 (secund. herb. Ach.); Darb., Mon. Roccell. p. 32 pr. p. (specimina esorediata).

In hae specie thallus est esorediatus, quare specimina sorediosa, sterilia, huc a pluribus auctoribus dueta, sejungenda sunt et ad *Roccella Arnoldi* Wain. (Arn., Lich. Exs. n. 1689) pertinent. *R. Canariensis* (Darb., *l.c.*, p. 50 pr. p.) sporis majoribus et reactionibus thalli (thallus neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens, medulla jodo caerulescens) a *R. tinctoria* differt. *R. Sinensis* Nyl. his reactionibus cum *R. tinctoria* congruit, at thallo minore apothecis peltatis basique constrictis et sporis ab ea differt.

Var. **subpodicellata** Wain.

Thallus long. circ. 8 ad 15 cent., basin versus crass. circ. 1.5 ad 4 mm., prostratus, livido-albidus, pruinosis, KHO non reagens,  $\text{CaCl}_2\text{O}_2$  rubescens, esorediatus, ramis omnibus teretibus aut vetustioribus compressiusculis, rigidis. Apothecia pruinosa, pri- mum innata, denun. elevata et basi plus minusve constricta, vetusta etiam breviter stipitata, primum plana marginataque.

demum convexa et saepe etiam immarginata, lateralia. Sporae fusiformes, 3-septatae, long. 0.015 ad 0.021, crass. 0.0045 ad 0.005 mm., leviter curvatae, decolores, apicibus obtusis. Medulla jodo caerulescens. *F. dichotoma* Ach. secund. herb. Ach. apothecis sessilibus (non stipitatis) a *f. subpodicellata* differt.

MOSSAMEDES.—Ad rupes Oceani Atlantici prope Cazimba (via versus Cabo Negro). No. 406 pr. p.

**F. complanata** Wain.

Thallus longitudine circ. 15 ad 20 cm., ramis vetustioribus circ. 4 ad 2 mm. latis, plus minusve compressis, ramis junioribus anguloso-compressis, KHO non reagens,  $\text{CaCl}_2\text{O}_2$  rubescens, esorediatus, rigidus. Medulla jodo caerulescens. Apothecia lateralia, pruinosa, demum breviter stipitata.

MOSSAMEDES.—Ad rupes Oceani Atlantici prope Cazimba (via versus Cabo Negro). No. 406 pr. p.

“Formam cylindricam et complanatam non raro eadem in rupe inveni” (Welw. in sched.).

**2. *R. Africana*** Wain., n. sp.

Thallus elongatus, long. circ. 20 ad 25 cent., basin versus crass. circ. 1.5 ad 2 mm., livido-pallescens, leviter pruinosis, KHO rubescens,  $\text{CaCl}_2\text{O}_2$  rubescens, esorediatus, rigidus, ramis omnibus teretibus aut ad axillas plus minusve compressis dilatatisque. Apothecia lateralia, basi constricta, demum saepe subpodicellata, marginata, disco planiusculo, pruinosa. Sporae long. circ. 0.024, crass. 0.005 mm., rectae aut leviter curvatae, fusiformes, apicibus acutis. Hymenium jodo non reagens aut passim levissime caerulescens. Medulla jodo caerulescens.

BENGUELLA.—Inter *Roccellam* ad portum Novo Rodondo advectam legit A. Lopes de Silva. No. 405.

Reactione thalli a *R. tinctoria* et *R. portentosa* Mont. differt, a posteriore etiam apothecii basi constricta. In *R. portentosa* et *R. dubia* Darb. thallus neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens, medulla jodo caerulescens.

**3. *R. hypomecha*** (Ach.) Nyl. in Hue, Lich. Exot. p. 60; Darb., Mon. Rocc. p. 37.

**Var. *isabellina*** Wain.

Thallus esorediatus, opacus, teres, leviter pruinosis, pallescens aut testaceus, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens.

MOSSAMEDES.—Ad rupes maritimas loco dicto Cazimba inter Mossamedes et Porto Pinda parce et sterilis. No. 404.

*R. dubia* Darb. et *R. Canariensis* (Darb.) reactionibus solitis huic variationi congruunt et habitu thalli parum ab ea differunt, at thallo epuruinoso ab ea distinguuntur.

**Var. *Benguellensis*** (Welw.) Wain.

Thallus esorediatus, albus, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens.

MOSSAMEDES.—Ad rupes juxta Oceanum Atl. prope Cabo Negro. No. 403.

Apothecia demum sessilia, convexa, hemisphaerica, basi leviter constricta, margine simplice thallode albido. Hypothecium fuscofuligineum. Sporae long. 0.020 ad 0.016, crass. 0.005 ad 0.0035 mm., rectae

aut parce curvatae. Thallus rigidus, vulgo teres, 1 ad 0.7 mm. crassus. Medulla jodo caeruleo-scaena.

*R. Gayana* Mont. (Darb., *l.c.*, p. 40) medulla jodo haud caeruleo-scaena (thallus neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens) a *R. hypomechia* differt.

4. **R. tuberculata** Wain., sp. n.

*R. Canariensis* Darb., Mon. Roc., p. 59 pr. p. (specimina sorediosa).

Thallus rigidus, long. 30 ad 80 mm., basin versus crass. 3 ad 0.7 mm., livido-albescens, pallescens aut fuscescens, pruinosus, soraliis tuberculiformibus aut saltem margine elevatis instructus, neque KHO, nec  $\text{CaCl}_2\text{O}_2$  reagens, dichotome repetito-ramosus, ramis teretibus. Medulla alba, jodo leviter caeruleo-scaena.

INS. CAPITIS VIRIDIS. Ad rupes in insula Fogo leg. Pharmacop. Torres. No. 419. Ster.

Var. **Vincentina** Wain.

Thallo passim leviter pruinoso et soraliis  $\text{CaCl}_2\text{O}_2$  rubentibus a *R. tuberculata* differt, at forsitan non est autonoma species. Ceterum thallus neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens. Medulla alba, jodo caeruleo-scaena. Soralia elevata.

INS. CAPITIS VIRIDIS. Hinc inde ad rupes maritimas insule S. Vincentii. No. 402 pr. p.

5. **R. Mossamedana** Wain., sp. n.

Thallus livido-pallescens aut albidus, soraliis cinereis, haud aut vix elevatis instructus, KHO rubescens,  $\text{CaCl}_2\text{O}_2$  non reagens, rigidus, long. circa 25 ad 30 mm., basin versus crass. circa 0.5 ad 0.7 mm., crebre dichotome repetito-ramosus, ramis teretibus. Medulla alba, jodo haud reagens.

MOSSAMEDES.—Ad rupes in summis jugis Serra de Montes Negros. No. 418. Ster.

6. **R. Arnoldi** Wain.

*R. tinctoria* Darb., *l.c.*, p. 32 pr. p. (specimina sorediosa); Arn., Lich. Exs. n. 1689.

Thallus rigidus, ramis teretiusculis, passim levissime pruinosus, sorediosus, glauco-scaena aut fuscescens, KHO non reagens,  $\text{CaCl}_2\text{O}_2$  rubescens, etiam soralia  $\text{CaCl}_2\text{O}_2$  rubescens. Medulla basis et placentae alba, jodo caeruleo-scaena. Habitu similis est *R. fuscoides* (Dicks.) Wain. (*Lichen fuscoides* Dicks., Crypt. Fase. iii. 1790, p. 22, secund. specim. authent. in herb. Ach. ad *R. phycopsis* Darb. vel *R. phycopsis* Ach., Lich. Univ. 1810, p. 410 pr. p. spectat), at colore medullae placentae ab ea differt, reactionibus, KHO,  $\text{CaCl}_2\text{O}_2$  et jodo productis, cum ea congruens. In *R. difficili* Darb., *l.c.*, p. 49, thallus KHO non reagens,  $\text{CaCl}_2\text{O}_2$  leviter rubescens, soralia  $\text{CaCl}_2\text{O}_2$  non reagentia, medulla jodo caeruleo-scaena. In *R. Caribea* Darb., *l.c.*, p. 53, thallus neque KHO nec  $\text{CaCl}_2\text{O}_2$  reagens, soralia  $\text{CaCl}_2\text{O}_2$  rubescens, medulla jodo caeruleo-scaena. *R. Arnoldi* tantum sterilis est cognita, at saltem thallo soredioso a *R. tinctoria* differt. In *Roccellis*, sicut in speciebus plurimis lichenum, presentia et absentia soraliuum nota est valde constans.

Quum non est constans, specimina sorediosa et esorediata transeunt. Ita forsitan res se habet in nonnullis speciebus *Roccellarum*, at minime in speciebus plurimis.

MOSSAMEDES.—Frequenter ad rupes calcareas inter Saco et Boca de Rio Giraúl. No. 417 pr. p. Ster.

7. *R. linearis* Wain., sp. n.

*R. fuciformis* a. *R. linearis* Ach., Lich. Univ. (1810), p. 440 pr. p. (specimen e Sumatra in herb. Ach.; specimen e Nova Hispania ad *R. fuciformem* DC. pertinet). *R. Montaguei* Nyl. in Hue, Lich. Exot. p. 61 pr. p.; Darb., Mon. Roccell. p. 24 pr. p.

Thallus sat mollis, compressus, epruinosus,  $\text{CaCl}_2\text{O}_2$  superne rubescens, intus leviter rubescens, soraliis minutis, parum elevatis. Medulla jodo bene caerulescens. Stratum medullare placenta albidum. Solum sterilis visa.

Var. *primaria* Wain.

Soralia  $\text{CaCl}_2\text{O}_2$  non reagentia (sicut in specim. orig. in herb. Ach.). Thallus KHO non reagens.

LOANDA.—Ad *Rhizophoram* in insula Loanda. No. 409 pr. p. Frequentissime ad ramos *Adansoniae*, *Euphorbiæ candel*. aliarumque arborum inter Loanda et Quicuje. No. 413. Inter Camama et Calumbo prope Loanda. No. 414.

LIBONGO.—Frequenter ad *Hyphaenæ coriaceam*, *Chrysobalanum* et omnes fere frutices littorales inter Libongo, Bombo et Barra do Bengo. No. 411.

BENGUELLA.—Frequenter ad varias species *Acacia* prope urbem Benguella. No. 412 pr. p.

ZENZA DO GOLUNGO (regio littor. et superior).—Ad truncos *Adansoniæ* circa Calungembo, at hac in distantia ab Oceano jam valde rara. No. 415.

MOSSAMEDES.—Ad *Euphorbiæ bellidæ* prope Mossamedes. No. 420.

AMBRIZ.—Ad ramulos fruticum maritimorum inter Ambriz et flumen Lifune.

Var. *hyperchromatica* Wain.

Soralia  $\text{CaCl}_2\text{O}_2$  rubescens. Thallus KHO non reagens.

LOANDA.—Ad rupes maritimæ non procul a Morro de Santa Catharina, at non frequens. No. 422 pr. p.

Huc etiam pertinent Zw. Lich. Exs. n. 517 (ex Angola), n. 518 (St. Paul de Loanda). *R. fuciformis* DC. thallo rigidiore et crassiore, extus  $\text{CaCl}_2\text{O}_2$  non reagente ab hac variatione differt. *R. Peruensi* (Krempehl.) Wain. (Darb., Mon. Roccell. p. 47 pr. p.: specimina sorediosa) medulla basis lutea ab hac variatione distinguitur. *R. Babingtonii* Mont. Syll. p. 321, thallo esorediato a *R. Peruensi* differt.

Var. *Guineensis* Wain.

Thallus KHO demum solutionem leviter rubescentem effundens,  $\text{CaCl}_2\text{O}_2$  rubescens. Soralia  $\text{CaCl}_2\text{O}_2$  haud reagentia.

INSULA S. THOMÆ.—Ad rupes maritimæ. No. 421. Ster.

Ad *R. lineare* pertinet etiam *R. Montaguei* v. *rigidula* Müll. Arg., Lich. Beitr. (1879), n. 126, Lich. Afr. Occ. (Linnaea 1880), p. 31, ad Chinchoxo (v. *hyperchromatica*) et Landana (v. *primaria*) a Pechuel-

*Loeschea lecta* (secund. herb. Müll.). Conf. Darb. Mon., Roccella, p. 90, tab. 6, fig. 21.

8. **R. Montagnei** Bél., Voy. Ind. Or. p. 117 (secund. specim. authent. e Madagascaria in coll. Welw. n. 401); Nyl. in Huc. Lich. Exot. p. 61 pr. p.

*R. fusciformis* Ach., Lich. Univ. p. 410 (excl. var.) secund. herb. Ach. *Lichen fusciformis* L., Sp. Pl. n. 38, secund. icon. cit. Dill. pr. p. ad *R. Montagnei* Bél., pr. p. ad *R. fusciforme* DC. spectat.

Thallus compressus, sepe etiam angulosus, epruinosis, mollis, esorediatus,  $\text{CaCl}_2\text{O}_2$  extus rubescens, intus non reagens, KHO non reagens. Apothecia lecanorina, basi constricta, sessilia, disco plano aut rarius demum convexo, margine persistente. Medulla jodo caeruleo-scapens. Rami elongati aut breves, angusti aut dilatati, levigati aut reticulatim nervosi, pallidi aut glaucescenti-albidi. Medulla placenta et basis thalli alba aut ochracea (etiam in specim. orig. Bélang. ochracea, sed haud lutea).

**LOANDA.**—Ad ramos *Acacia* et *Rhizophora* prope Zamba grande. No. 410. Frequentissime ad truncoes et ramos vigentes et siccios arborum et fruticum juxta litus Angolae, at in ditione Loandensi rarissime fructificans.

**BENGUELLA.**—Ad truncoes ramosque *Acaciaceae* in montosis inter urbem Benguella et Serra das Bimbas. Nos. 401 (fert.), 412 pr. p. (ster.).

**AMBRIZ.**—Ad *Acacia* et *Imeurius* in territorio Mossulensi. No. 408. Fert. Haec specimina ad f. *obtusum* Wain., laciinis latis (7 ad 2 mm.) obtusisque thalli dignotam, pertinent.

9. **R. podocarpa** sp. n. Welw. in herb.

Thallus elongatus, long. circ. 1 ad 2 decim., mollis, epruinosis, ramis crassioribus plus minusve compressis, circ. 2 ad 6 mm. latis, ramis tenuioribus leviter aut parum compressis, esorediatus, glaucescenti-albidus, extus  $\text{CaCl}_2\text{O}_2$  rubescens, intus non reagens, KHO non reagens, levigatus aut rugulosus aut angulosus. Medulla basis thalli et placente alba, jodo caeruleo-scapens. Apothecia elevata, basi constricta, jam sat juvenilia breviter podicellata, disco plano aut demum convexiusculo, pruinosa, margine lecanorino, simplice, persistente. Hypothecium fuscum. Spores fusiformes, decolores, 3-septatae, recte aut leviter curvatae, long. 0.022 ad 0.026, crass. 0.001 ad 0.0045 mm., apicibus obtusis. *R. Mauritiana* (Darb., l.c., p. 46 pr. p., excl. specim. sorediosis) secund. specim. in herb. Müll., reaktionibus a  $\text{CaCl}_2\text{O}_2$  et KHO productis cum haec specie congruit, at apothecis solum demum substipitatis (sporis tenuioribus, observante Darb.) et thallo rigido minoreque ab ea differt. *R. Baffourii* Müll. Arg., Diagn. Lich. Socot. p. 43, secund. specim. in herb. Müll. item reaktionibus cum *R. podocarpa* congruit, at thallo brevi ab ea differt (apothecia partim stipitata). Etiam in *R. decipiente* Darb. et *R. fuscida* Darb. thallus  $\text{CaCl}_2\text{O}_2$  rubescens, at KHO non reagens.

**AMBRIZ.**—Ad ramos *Adansonia digitata* retro Mubango in interioribus ex Ambriz. No. 407. Fert.

**MOSSAMALDES.**—Ad ramos *Tamarindus* et *Acaciaceae* juxta ripas fluminis Maiombo prope Pão. No. 416. Ster.

## TRIB. II.—GRAPHIDEAE.

1. **GRAPHIS** (Adans.) Nyl.

1. Gr. (*Phæographina*) **Montagnei** V. d. Bosch in Mont. Syll. p. 346.

*Phæographina Montagnei* Müll. Arg., Lich. Beitr. n. 483 (156).

\***Gr. deducta** (Nyl.) Wain.

\**Lecanactis deducta* Nyl., Fl. 1886, p. 176. \**L. deducens* Nyl., Lich. Guin. (1889), p. 32.

INS. PRINCIPIS.—Ad corticem arboris in Pico de Papagaio. No. 395.

Hymenium rubescens, epithecio rubro-fuligineo. Peritheciun integrum, fuligineum. Sporæ solitariae, murales, dilute fuscantes, long. circ. 0·070 ad 0·090, crass. 0·022 ad 0·026 mm.

2. **Gr. pachnodes** Fée, Ess. Crypt. Ecore. p. 34, tab. 8, fig. 4.

*Phæographina pachnodes* Müll. Arg., Graph. Féean. p. 50.

Thallus albido-glaucens, KHO lutescens et demum rubescens. Peritheciun pallidum, tenue. Hymenium jodo non reagens. Epitheciun pallidum. Sporæ 8nae, obscuratæ, murales, septis transversalibus 7 ad 8, long. 0·019 ad 0·032, crass. 0·008 ad 0·012 mm. Apothecia margine albido, crassitudine mediocri, discum et thallum superante. Discus caesiopruinosus. Affinis est *Gr. ornatae* (Müll. Arg., Lich. Beitr. n. 1050).

GOLUNGO ALTO.—Ad corticem arboris Euphorbiaceæ in editis in Quilombo Quiacatubia. No. 379. Ad corticem arboris Bombolo dictæ (*Melia dubia*) prope Cungulungulo. No. 377.

3. **Gr. fuscens** Wain., sp. n.

Thallus crassitudine mediocris, circ. 0·3 mm., areolato-rimosus, levigatus, subopacus, obscure fuscens. Apothecia saepe approximata aut in serie brevi disposita, rotundata aut oblonga, long. 0·3 ad 1 mm., latit. 0·3 ad 0·2 mm., thallo immersa. Discus urceolato-impressus, nigricans, nudus, immarginatus. Peritheciun tenuissimum, pallidum. Hymenium jodo non reagens. Epitheciun pallidum, KHO non reagens. Paraphyses simplices aut pr. p. apicem versus parvissime ramoso-connexæ, apice haud incrassatae. Sporæ solitariae, murales, fuscantes-pallidæ, long. circ. 0·110, crass. 0·026 mm. Medulla thalli KHO rubescens.

GOLUNGO ALTO.—Ad corticem *Fici pseudoelasticae* prope Rodrigo. No. 443.

4. **Gr. (Graphina) subserpentina** Nyl., Lich. Nov.-Gran. p. 465, ed. 2, p. 360.

Thallus glaucescens, KHO levissime flavescens et demum fuscens. Peritheciun fuligineum, dimidiatum, labiis superne anguste denudatis, haud striatis, thallo immersum aut saepe demum amphithecio thallino abrupte leviter elevato. Sporæ solitariae, murales, cellulis numerosissimis, decolores, jodo violascentes, long. 0·070 ad 0·110, crass. 0·018 ad 0·026 mm.

AMBRIZ.—Ad corticem truncorum vetustorum (Eneumbi i.e. *Culciam antiscorbutica*). No. 391.

5. **Gr. Ambrizensis** Wain., sp. n.

Thallus tenuis, continuus, opacus, sat levigatus, albidus, KHO lutescens et demum rubescens, hypothallo obscurato partim limitatus. Apothecia approximata, elongata, long. circ. 6 ad 2 mm., latit. circ. 0·4 ad 0·3 mm., simplicia aut parcus ramosa, vulgo curvata aut flexuosa, demum leviter elevata, basi abrupta aut constricta. Peritheciun latere fuliginosum, basi albido, labiis conniventibus, demum passim anguste hiantibus, superne denudatis, inferne amphithecio thallino obductis. Discus rimae formis aut demum leviter dilatatus, nigricans, nudus. Hymenium jodo non reagens. Epitheciun fuscescens. Spore solitariae, murales, decolores, jodo violascentes, long. 0·051 ad 0·065, crass. 0·014 ad 0·016 mm. Comparabilis cum *Gr. subcontorta* Müll. Arg., Lich. Parag. p. 24, qua sporis majoribus differt.

AMBRIZ.—Ad corticem arboris Encumbi (i.e. *Calesia antiscorbutica*). No. 392.

6. **Gr. obtecta** (Nyl.) Wain. Nyl., Lich. Nov. Gram. ed. 2, p. 368 (excl. var.), Fl. 1869, p. 72 (pro parte).

*Graphina obtecta* Müll. Arg., Lich. Afr. Oce. (Linnaea 1880), p. 37; Lich. Beitr. n. 474.

Ad cortices secus flumen Quillu leg. Pechuel-Loesche teste Müll. Arg., Lich. Afr. Oce. p. 37.

INS. PRINCIPIS.—Ad trunco arborum. No. 359.

7. **Gr. subnitida** Nyl. in Leight. Lich. Amaz. p. 453; Nyl., Lich. Guin. p. 49; Wain., Lich. Antill. p. 25.

GOLUNGO ALTO.—Ad corticem arboris Zanthoxylaceæ in Alta Queta. No. 356 pr. p. Spore 8næ, decolores aut dilutissime pallescentes, jodo non reagentes, septis transversalibus circ. 10, cellulæ sat numerosis, long. 0·025, crass. 0·012 mm.

8. **Gr. sorediella** (Müll. Arg.) Wain.

*Graphina sorediella* Müll. Arg., Lich. Afr. Oce. (Linnaea 1880), p. 38. Corticola in planicie depressa secus flumen Quillu a Pechuel-Loesche lecta.

9. **Gr. straminea** Wain., sp. n.

Thallus crassitudine medioeris, continuus, leviter subgrannulosoinæqualis, opacus, stramineus aut rarius testaceo- vel ochraceostramineus, neque KHO, nec CaCl<sub>2</sub>O<sub>2</sub> distincte reagens. Apothecia oblonga aut difformia, long. circ. 2·5 ad 0·7, latit. 0·7 ad 0·6 mm., leviter elevata. Discus planus, stramineo-pruinosus aut demum denudatus nigricansque, amphithecio thallino peritheciun tenuem obducte, leviter elevato, basi constricto, labiis hiantibus, crassitudine medioeribus instructo cinctus. Peritheciun laterale et basale tenui, fusco-rufescens aut pallidum. Epitheciun pallidum aut flavescentes. Hymenium jodo non reagens. Spore solitariae, murales, cellulæ numerosissimis, decolores, jodo violascentes, long. circ. 0·110 ad 0·150, crass. 0·025 ad 0·010 mm. Amphitheciun intus jodo caerulescens. Medulla thalli jodo non reagens.

Var. **flavida** Wain. Thallus stramineus.

GOLUNGO ALTO.—Ad corticem truncorum vetustorum in sylvis primitivis prope Sange. Nos. 396 pr. p., 458.

Var. *testacea* Wain. Thallus testaceo-vel ochraceo-stramineus.

GOLUNGO ALTO.—Ad corticem arborum in sylvis primitivis ad Cangulungulo. No. 384.

10. *Gr. ulcerata* Wain., sp. n.

Thallus sat crassus aut mediocris (circ. 0·6 ad 0·3 mm.), rimosus aut rimoso-areolatus, levigatus, subnitidus aut fere opacus, pallido-glaucescens, KHO lutescens et demum rubescens. Apothecia approximata, elongata aut rotundata difformiave, simplicia aut parce ramosa, long. circ. 2 ad 0·2 mm., 0·15 ad 0·25 lata, thallo immersa. Discus apertus, caesio-pruinosus, impressus, thallo marginatus. Peritheciun pallidum, tenue. Hymenium haud oleosum, jodo non reagens. Epitheciun pallidum. Sporae solitariae, murales, cellulis numerosissimis, decolores aut dilute pallide, jodo violascentes, long. 0·075 ad 0·106, crass. 0·030 ad 0·044 mm.

GOLUNGO ALTO.—Ad corticem truncorum vetustorum in Cungulungulo. No. 245.

11. *Gr. (Phæographis) navicularis* Wain., sp. n.

Thallus tenuis, continuus, subopacus, glaucescenti-albidus, leviter verruculoso-inaequalis, KHO non reagens, hypothallo indistincto. Apothecia oblonga aut elongata, long. 0·5 ad 2·5 mm., latit. 0·2 mm., simplicia aut parce ramosa, recta aut rarius leviter curvata, elevata, apicibus acutiusculis aut obtusis. Peritheciun fuligineum, dimidiatum, basi deficiens aut tenue fuscescensque, labiis nudis, levigatis, sat tenuibus, connivent-i-hiantibus. Discus dilatatus, nigricans, nudus. Hymenium jodo non reagens, asei vinose rubentes. Epitheciun fuscescens. Paraphyses apice capitatae. Spore 4—8næ, rarius etiam 3næ, nigricantes, 5-septatae, loculis lenticularibus, oblongæ, apicibus rotundatis aut obtusis; jodo parum reagentes, 0·020 ad 0·030, crass. 0·006 ad 0·008 mm.

LOANDA.—(0 ad 1000 ped. s. m.).—Ad corticem arborum et fruticum prope Teba et Cacuaco. No. 371. Prope Maianga d'el Rei. No. 372.

12. *Gr. phyllocharis* Wain., sp. n.

Thallus crassitudine mediocris, maculas parvas irregulares formans, nitidiusculus aut subopacus, glaucescenti-albidus, sat levigatus, KHO non reagens, hypothallo indistincto. Apothecia ellipsoidea aut oblonga, long. 0·4 ad 1 mm., latit. 0·2 ad 0·25 mm., simplicia, recta aut curvata, thallo immersa. Discus dilatatus, nigricans, nudus. Peritheciun tenue, parum distinctum, in margine fuscofuligineum. Paraphyses apice fusco-elavatae. Sporæ 8næ, obscuratae, 5-septatae, loculis lenticularibus, oblongæ, apicibus obtusis aut rotundatis, jodo carulescentes, long. 0·020 ad 0·022, crass. 0·006 ad 0·007 mm.

GOLUNGO ALTO.—Ad folia perennia arbusti Sapindacei in sylvis montosis densis prope Fonte Capopa. No. 393 pr. p. Solum parcissime visa.

13. **Gr. sexlocularis** Wain., sp. n.

Thallus hypophlooides, macula pallida indicatus. Thallus et apothecia (epitheciū) KHO crystalla rubra formantia. Apothecia oblonga aut ellipsoidea, long. 1.5 ad 0.3, lat. 0.3 ad 0.2 mm., leviter elevata, simplicia aut rarius parce ramosa, recta aut leviter curvata. Discus dilatatus, nigricans, denudatus aut tenuissime caesio-pruinosus, margine tenui thallino albido cinctus. Perithecium tenue, integrum, nigricans. Hypothecium fuscum aut superne albidum. Hymenium jodo non reagens. Sporae 8næ, distichæ, fuscescentes, 5-septatae, oblongæ, apicibus obtusis aut rotundatis, jodo fuscescenti-rubentes, long. 0.018 ad 0.028, crass. 0.006 ad 0.007 mm. Affinis est *Gr. medusaformi* Kremp.

GOLUNGO ALTO.—Ad truncos *Zygia (Albitzia coriaria)* juxta riv. Quiapose. No. 345 pr. p.

14. **Gr. labyrinthica** (Ach.) Wain.

*Glyphis* Ach., Syn. Lich. p. 107. *Sarcographa* Müll. Arg., Graph. Ficæan, p. 62, Lich. Beitr. n. 1102.

Thallus KHO non reagens. Pseudostromata KHO lutescentia et demum fulvescentia. Hymenium jodo non reagens. Sporae 8næ, fuscescentes, 3- ad 5-septatae, loculis lenticularibus, oblongæ apicibus obtusis, fuscescentes, jodo sordide rubentes, long. 0.015 ad 0.020, crass. 0.006 ad 0.008 mm. Discus pruinosus.

GOLUNGO ALTO.—Ad corticem *Zanthoxylī* in sylvis primitivis editioribus in Serra de Alta Queta. Nos. 339, 340 pr. p.

15. **Gr. sericea** (Eschw.) Wain.

*Leiogramma sericeum* Eschw. in Mart. Fl. Bras., p. 99. *Glyphis sericea* Nyl. Prodr. Nov. Gram. Addit. p. 341. *Photographis* Müll. Arg., Fl. 1888, p. 523.

Habitu similis est *Gr. medusaformi* Krempelh. (Wain., Etud. Lich. Brés. II., p. 115). Thallus nequidem circa apothecia KHO reagens. Pseudostromata haud distineta. Apothecia ramosa aggregataque. Discus tenuissime livido-pruinosus. Hymenium jodo dilute rubescens. Epitheciū fuscum. Sporae 8næ, distichæ, fuscescentes, 3-septatae, long. 0.015 ad 0.020, crass. 0.006 ad 0.007 mm. Hypothecium fuscescens.

GOLUNGO ALTO.—Ad corticem arboris in sylvis primitivis prope Cungulungulo. No. 383. Ad truncos vigentes *Spindalis* prope Sange. No. 385.

16. **Gr. (Scolæcospora) dracænæ** Wain., sp. n.

Thallus tenuis, albidus, opacus, continuus, parce granulosus. KHO lutescens et demum rubescens, inferne jodo caeruleo-violaceus, hypothallo nigricante limitatus. Apothecia sat approximata, elongata, long. 2.5 ad 0.7, latit. 0.2 ad 0.15 mm., ramosa, flexuosa, curvataque, elevata. Perithecium fuliginosum, integrum, partim basi tenui, labiis conniventibus, levigatis, superne denudatis, inferne anguste ampliithecio thallino parum distincto obductis. Discus riniformis, inconspicuus. Epitheciū fuscescens. Sporae 8næ, distichæ, 7- ad 9-septatae, decolores, jodo caeruleo-violaceentes, long. 0.024 ad 0.026, crass. 0.007 mm. Subsimilis est *Gr.*

*unfractuosa* Eschw. (in Mart. Fl. Bras. p. 86, Müll. Arg., Fl. 1888, p. 511, Krempelh., Warm. Lich. Bras. p. 26), quæ sporis majoribus et reactionibus ab ea differt.

GOLUNGO ALTO.—Ad trunços *Dracaena parviflora* Bak. in sylvis editis primitivis ad Carengue. No. 397 pr. p.

17. **Gr. ochroplaca** (Nyl.) Wain.

*Gr. scripta* <sup>\*</sup>*ochroplaca* Nyl., Lich. Angol. p. 14.

Thallus tenuis, sat continuus, opacus, ferruginoso-ochraceus, passim parce albidus, KHO non reagens. Apothecia sat approximata, vulgo elongata, long. 2 ad 0·3 mm., latit. 0·15 ad 0·1 mm., simplicia aut parce ramosa, partim flexuosa curvatave, elevata. Perithecium fuligineum, integrum, basi tenue, labiis conniventibus, laevigatis, superne denudatis, inferne amphithecio thallino parum distincto anguste obductis. Discus rimateformis, inconspicuus. Epitheciū fuscescens. Sporæ 8næ, distichæ, 6- ad 8-septatae, decolores, long. 0·020 ad 0·024, crass. 0·006 ad 0·007 mm., jodo violascentes.

GOLUNGO ALTO.—Ad corticem trunci putrescentis in silva prope Sange. No. 396.

18. **Gr. scripta** (L.) Ach.

GOLUNGO ALTO.—Ad truncum *Fici pseudoelastica* prope Sange. No. 381 pr. p. Discus apertus, nudus. Perithecium fuligineum, dimidiatum, basi deficiens aut tenue. Paraphyses fusco-capitatae. Sporæ 8næ, 8- ad 9-septatae, decolores, jodo violascentes, long. circ. 0·026, crass. 0·007 mm.

19. **Gr. tenella** Ach., Syn. Lich. p. 81; Wain., Etud. Lich. Brés. II. p. 121.

GOLUNGO ALTO.—Ad corticem *Fici pseudoelastica* (no. 381 pr. p.) et *Spondiacearum* (nos. 347 pr. p., 365) prope Sange. Ad corticem *Zygia* juxta riv. Quiapoze prope Sange (nos. 345 pr. p., 386). Ad corticem arboris *Zanthoxylaceæ* in montibus (no. 356 pr. p.) et ad corticem *Swietenia* in sylvis primitivis (no. 366) in Alta Queta prope Sange. Ad corticem *Zygia* in palmetis juxta ripas rivi Quiapoze prope Sange (nos. 225, 454). Ad corticem *Mimose* prope Camilungo (no. 352). Ad corticem *Spondiadis* prope Trombeta (no. 388). Ad corticem *Dracaena* in sylvis editis primitivis ad Carengue (no. 397 pr. p.).

AMBACÁ.—Ad corticem arboris prope Puricarambola (no. 374 pr. p.).

20. **Gr. foliicola** Wain., sp. n.

Thallus crassitudine mediocris, maculas parvas irregulares formans, nitidiusculus, leviter inæqualis, glancescenti-albidus, KHO haud distincte reagens, hypothallo indistincto. Apothecia elongata, long. 2 ad 0·7, latit. 0·2 ad 0·15 mm., simplicia aut parce ramosa, vulgo flexuosa curvatave, primum immersa, demum elevata. Perithecium fuligineum, dimidiatum, basi deficiens, labiis conniventibus aut demum anguste hiantibus, tenuiter cæsiopruinosis, laevigatis, latere amphithecio thallino obductis. Discus rimateformis aut passim concavus, nigricans, nudus. Epitheciū fuscescenti-rufescens. Sporæ 8næ, 7- ad 9-septatae, decolores, jodo cerulescentes, long. 0·024 ad 0·032, crass. 0·008 mm., apicibus obtusis. Habitu similis est *Gr. assimili* Nyl.

GOLUNGO ALTO.—Ad folia arbusti Sapindacei in sylvis montosis densis prope Fonte Capopa, una cum *Gr. phyllochloride* Wain. No. 393 pr. p.

21. **Gr. Afzelii** Ach., Syn. Lich. p. 85; Müll. Arg., Graph. Féean, p. 37; Wain., Etud. Lich. Brés. II, p. 124.

Peritheciun fuligineum, dimidiatum, basi deficiens, extus et intus strato albo omnino obductum, labiis conniventibus. Spore Siae, 3-septatae, decolores, jodo non reagentes. Metaplasia ascorum jodo rubescens.

GOLUNGO ALTO.—Ad corticem arborum prope Trombeta. No. 378.

22. **Gr. roseotincta** Wain., sp. n.

Thallus crassitudine medioeris, levigatus, opacus, continuus aut rimosus, pulchre roseus aut passim parce albido-pallescens. KHO lutescens. Apothecia elongata aut partim rotundata, long. 7 ad 0.2 mm., recta aut flexuosa, immarginata, thallo immersa. Discus impressus, 0.25 ad 0.15 mm. latus, cesiopruinosus. Peritheciun tenue, albidum. Spore hand visae.

GOLUNGO ALTO.—Ad corticem truncorum vetustorum *Coffea arabica* prope Cungulungulo. No. 349.

23. **Gr. cicatricosa** (Ach.) Wain.

*Glyphys cicatricosa* Ach., Syn. Lich. p. 107.

Var. **simplicior** Wain., Etud. Lich. Brés. II, p. 127.

GOLUNGO ALTO.—Ad *Spondias* prope Trombeta (no. 343). Ad truncoes *Zygia* juxta ripas rivuli Quiapoze prope Sange (no. 346). Ad truncoes *Fici* prope Bango-Aquitamba (no. 344 pr. p.). Ad corticem arboris prope Quilombo Quiacatubia (nos. 341, 380 pr. p.). Ad corticem arboris prope Cungulungulo (no. 342).

## 2. HELMINTHOCARPON Fée.

1. **H. Le-Prevostii** Fée, Ess. Crypt. Ecore. Suppl. p. 156; Wain., Etud. Lich. Brés. II, p. 129.

DANDE.—Ad corticem trunci arboris juxta ripas fluminis Lifune. No. 390.

## 3. OPEGRApha (Humb.) Wain.

1. **O. (Dictyographa) Angolensis** Wain., sp. n.

Thallus tenuis, albidus, levigatus, opacus, dispersus aut partim continuus. Apothecia approximata, elevata, long. 1 ad 0.3, latit. 0.3 ad 0.2 mm., elongato-oblonga aut ellipsoidea difformiavae, simplicia aut raro fureata. Peritheciun fuligineum, dimidiatum, labiis primum conniventibus, denum saepe hiantibus, levigatis, nudis aut primum din. latere tenuissime thallodice obducta. Hypothecium pallidum aut dilute fuscescens. Discus rimeformis aut denum dilatatus, niger aut fusco-nigricans, nudus, opacus. Hymenium jodo vinose rubens, haud cærulescens. Epitheciun dilute fuscescens aut pallidum aut fere decoloratum. Paraphyses ramoso-connexæ, ramis inerebris, apice haud incrassatae. Ascii oblongi, membrana denum parum incrassata, primum aequaliter incrassata. Spore Siae, oblongæ, apicibus rotundatis aut obtusis,

decolores, murales, septis transversalibus 8 ad 10, loculis apicalibus simplicibus, loculis mediis omnibus aut nonnullis septo longitudinali in cellulas duas divisis, jodo haud reagentes, long. 0·021 ad 0·030, crass. 0·005 ad 0·007 mm. Affinis est *O. (Dictyographa) Arabica* (Müll. Arg., Lich. Arab. p. 131) et *varianti* (Müll. Arg., Lich. Socot. p. 379).

**LOANDA** (0 ad 1000 ped. s. m.).—Ad trunco ramosque *Rhizophorarum* in insula Loanda socialis cum *Roccella Montagnei*. No. 351. Ad ramos *Balsamodendri* prope Boa Vista una cum *Arthonia gregaria* v. *speciosa*. No. 361. Ad ramos *Adansoniae* prope Praia de Zamba una cum *A. gregaria* v. *speciosa*. No. 369.

**2. O. (Euopegrapha) prosodea** Ach., Meth. Lich. p. 22; Müll. Arg., Graph. Féean. p. 18.

Corticola in planicie seces flumen Quillu a Pechuel-Loesche lecta, teste Müll. Arg., Lich. Afr. Occ. p. 38.

**3. O. cylindrica** Raddi; Wain, Etud. Lich. Brés. II. p. 132. *O. Bonplandi* Fée, Ess. Crypt. Ecore. p. 17; Müll. Arg., Graph. Féean. p. 17, Lich. Afr. Occ. p. 38.

**LOANGO.**—In cortice emortuo Palmarum lecta a Pechuel-Loesche, teste Müll. Arg., Lich. Afr. Occ. p. 38.

**4. O. subvulgata** Nyl., Fl. 1869, p. 71; Wright, Lich. Cub. n. 101 C in herb. meo (haud Cromb., Chall. Exp. p. 226).

Peritheciun integrum, fuligineum, labiis conniventibus. Hymenium jodo vinose rubens (haud cærulescens). Sporæ 8næ, decolores, 7-septatae, loculis sat aequalibus, halone nullo indutæ, long. 0·030 ad 0·038, crass. 0·005 mm.

**GOLUNGO ALTO.**—Ad truncum fruticis arborescentis *Lophostylilis* (i.e. *Securiduca Welwitschii*) in silvis primitivis in Serra de Alta Queta. No. 323 pr. p.

**5. O. septemseptata** Wain., sp. n.

Thallus tenuis, leviter verruculoso-inaequalis aut sat levigatus, albido-glaucescens, opacus, continuus aut rimulosus, partim linea nigricante limitatus. Apothecia approximata, elevata, oblonga aut rarius elongato-oblonga ellipsoideave, vulgo recta, long. 1 ad 0·3, latit. 0·25 ad 0·15 mm., simplicia aut raro 3-radiata. Peritheciun fuligineum, integrum, labiis levigatis, conniventibus aut parcis demum hiantibus. Labia nigra, at microscopio visa solum margine denudata et inferne strato tenuissimo albido obducta. Hypothecium fuligineum, sat crassum. Discus rimæformis aut parcis demum dilatatus, nigricans, nudus. Hymenium jodo vinose rubens, haud cærulescens. Epitheciun fuligineum, KHO smaragdulo-fuligineum. Ascii oblongi, membrana sat tenui. Paraphyses ramoso-connexæ. Sporæ 8næ, decolores, halone indutæ, 5- ad 7-septatae, loculis 1 ad 2 mediis reliquis multoties longioribus, long. 0·032 ad 0·043, crass. 0·005 ad 0·006 mm. (euni halone 0·010 mm.). Affinis *O. confusulae* Müll. Arg., Graph. Féean. p. 17.

**GOLUNGO ALTO.**—Ad corticem arboris Artocarpeæ Musibiri (i.e. *Myrianthus arboreus*) prope Sange. No. 376 pr. p.

6. **O. ochracea** Wainio, sp. n.

Thallus tenuis, leviter verruculoso-inequalis, pruina albido ochracea, opacus, continuus aut rimulosus, partim linea nigricante limitatus. Apothecia approximata, elevata, elongata aut oblonga aut parce etiam ellipsoidea, long. 2 ad 0.3, latit. 0.25 ad 0.3 mm., leviter flexuosa aut sat recta, simplicia aut raro furcata. Peritheium fuligineum, integrum, labiis hiantibus, ochraceo-pruinosus aut denudatis, levigatis. Discus dilatatus, ochraceo-pruinosus aut denum plus minusve denudatus. Hypothecium subhymeniale tenue, pallidum. Hymenium et hypothecium subhymeniale jodo persistenter caerulescentia. Epithecum fuscofuligineum. Paraphyses ramoso-connexae. Sporae 8 $\times$ 6, decolor, 3-septatae, long. 0.014, crass. 0.004 mm., halone nullo indutae.

LOANDA (0 ad 1000 ped. s.m.).—Ad corticem *Cardio* prope Boa Vista. No. 370.

7. **O. albocinerea** Wain., sp. n.

Thallus tenuis, sat levigatus, albus, opacus, continuus aut partim subdispersus. Apothecia bene approximata, semi-immersa, oblonga aut partim ellipsoidea rotundatae aut diformia, simplicia aut 3-radiata, recta aut curvata flexuosa, long. 0.8 ad 0.2, latit. 0.3 ad 0.2 mm. Peritheium fuligineum, integrum, labiis hiantibus, margine temui denum denudatis, latere strato thallino obductis. Hypothecium subhymeniale fuscescens. Discus dilatatus, tenuiter caesio-pruinosus. Hymenium jodo dilutissime caerulescens, dein vinose rubens. Epithecum fuscescens. Paraphyses ramoso-connexae. Sporae 8 $\times$ 6, decolor, 3-septatae, long. 0.018 ad 0.023, crass. 0.003 ad 0.004 mm., halone nullo indutae. Pyrenoconidia filiformi-cylindrica, curvata, long. 0.014 ad 0.012, crass. 0.0007 mm.

LOANDA (0 ad 1000 ped. s. m.).—Ad trunco *Stereulin* in collibus prope Boa Vista. No. 382.

8. **O. subrimulosa** Nyl., Fl. 1866, p. 293, Wright, Lich. Cub. n. 103b. (in herb. meo).

Thallus tenuissimus, cinereo-fuscescens. Peritheium fuligineum, integrum, basi crassum. Hymenium jodo vinose rubens, haud caerulescens. Epithecum fuscescens, KHO non reagens. Sporae 8 $\times$ 6, decolor, 3-septatae, long. 0.018 ad 0.022, crass. 0.003 ad 0.0035 mm., halone nullo indutae.

GOLUNGO ALTO.—Ad corticem arboris *Artoocarpae* Musubiri (i.e. *Myrianthus arboreus*) prope Alta Queta. No. 375.

9. **O. (Pleurothecium) prosodeoides** Wain., sp. n.

Thallus tenuis, sat levigatus, glaucescens aut olivaceo-glaucescenti-variegatus, opacus, continuus, linea nigricante limitatus. Apothecia approximata, elevata, elongata oblongatae aut parce etiam ellipsoidea, recta aut curvata, long. 1 ad 0.3, latit. 0.2 mm., simplicia. Peritheium fuligineum, dimidiatum, basi parte angusta deficiens, labiis levigatis, conniventibus. Hypothecium pallidum. Discus rimaeformis, nigricans, nudus. Hymenium jodo vinose rubens, haud caerulescens. Epithecum decoloratum. Paraphyses

ramoso-connexæ. Ascæ membrana tenui. Sporæ 8næ, decoloræ, fusiformi-aciculares, halone indutæ, 8- ad 13-septatae, long. 0.030 ad 0.056, crass. 0.006 ad 0.008 mm. (cum halone). Perithecio dimidiato a *O. prosodea* Ach. differt.

GOLUNGO ALTO.—Ad ramulos Artocarpeæ in Golungo Alto. No. 362 pr. p.

10. **O. graphidiza** Nyl., Lich. Ang. p. 12.

Peritheciū fuligineum, dimidiatum, basi deficiens. Labia diu conniventia, demum hiantia, strato tenui thallino obducta aut demum superne denudata, elevata. Hymenium jodo intense persistenter cærulescens, ascis vinose rubentibus. Hypothecium pallidum, tenui. Epitheciū obscuratum. Sporæ 8næ, decoloræ aut demum morbose nigricantes, primum halone indutæ, 5- ad 7-septatae (ad 9-septatae, observante Nyl., *i.e.*). Paraphyses parce ramoso-connexæ. Discus nigricans nudusque aut raro subpruinosus.

LOANDA (0 ad 1000 ped. s. m.).—Ad truncos vetustos *Euphorbiæ candelabri* inter Camama et Calumbo, una cum *Arthonia Angolensi*. No. 211 pr. p., 461 pr. p.

11. **O. Loandensis** Nyl., Lich. Ang. p. 13.

Apothecia semi-immersa. Peritheciū fuligineum, dimidiatum basique deficiens, at hypothecium fuscescens. Labia hiantia, extus primum strato tenui thallino obducta, demum superne denudata, semi-immersa. Discus dilatatus, nigricans nudusque aut demum pruinosus. Hymenium jodo vinose rubens, haud cærulescens aut primum passim dilutissime cærulescens. Epitheciū fuscescens. Paraphyses ramoso-connexæ. Sporæ 3- ad 5-septatae, halone nullo indutæ, decoloræ.

LOANDA.—Ad truncos vetustos *Euphorbiæ candelabri* in agro Loandensi frequenter cum *Arthonia Angolensi* (0 ad 1000 ped. s. m.). No. 398 pr. p.

CALUMBO.—Ad truncos vetustos *Euphorbiæ candelabri* inter Camama et Calumbo frequenter cum *Arthonia Angolensi*. No. 399 pr. p.

12. **O. (Aulaxina) Africana** Wain.

Thallus tenuissimus, albidus, tenuissime undulatus aut laevigatus, hypothallo nullo distineto. Gonidia globosa, diam. 0.005 ad 0.006 mm., simplicia, at habitu pleurococcoidea, membrana modice incrassata. Apothecia longitudine et latitudine circ. 0.2 mm., angulosa. Peritheciū fuligineum, dimidiatum, basi deficiens, labiis conniventibus, tenuissime thallino-vestitis. Discus dilatatus, rotundato-angulosus, fusco-nigricans. Hymenium jodo fulvescens. Epitheciū decoloratum. Ascæ clavati, long. circ. 0.030, crass. 0.016 ad 0.018 mm., membrana tenui. Paraphyses ramoso-connexe. Sporæ 8næ, decoloræ, oblongæ, 5- ad 3-septatae, loculis aequalibus, apicibus rotundatis obtusisve, long. 0.015 ad 0.017, crass. 0.004 ad 0.005 mm.

GOLUNGO ALTO.—Ad folia perennia arborum in sylva prope Sobado Bango Aquitamba. No. 302. Affinis est *O. relatae* (Müll. Arg.) Wain. (Müll. Arg., Lich. Beitr. n. 1532), at sporis magis divisis ab ea differens.

4. **CHIODECTON** (Ach.) Wain.1. **Ch. amyloplacum** Wain., sp. n.

Thallus sat tenuis aut medioctis, leviter inaequalis, albus, opacus, cerebre contextus, hypothallo nigricante cerebre contexto partim anguste limitatus. Apothecia cerebra approximataque, anguloso-orbicularia aut parce etiam ellipsoidea oblonga, diametro vulgo 0.6 ad 0.3 mm., primum duique immersa, denum emersa basique constricta, disco ciesio-pruinoso, margine duplice tenui, e perithecio proprio sublenudato nigricanteque et ex amphithecio thallino cerebre contexto formata. Peritheciun fuligineum, integrum, tenue. Amphitheciun tenue, gonidia contineat. Hypothecium rufescens, sat erassium. Hymenium jodo vinose rubens (vix caeruleuscens). Epitheciun fuscofuligineum. Paraphyses tenuissimae, ramoso-connexae. Spore 8næ, bacillares, apicibus obtusis, pluri-locales, septis 9 aut pluribus, denum fuscescentes (forsan morbose), long. 0.034 ad 0.010, crass. 0.0025 ad 0.004 mm., halone nullo indutæ. Habitu subsimile est *Levada onylareo* (Ehrh.) Nyl., Prodr. Lich. Gall. p. 137 (*Levanaectidi illecebrosa* Hepp., Flecht. Eur. n. 533), et affine forsitan est *Levadaectidi stictica* Dur. et Mont. (Nyl., Lc., p. 161).

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Euphorbia candelabrum* una cum *Opegrapha graphidiza* et *Arthonia Angolensis*. No. 400 pr. p.

2. **Ch. strigulinum** (Nyl.) Wain., Etud. Lich. Brés. II, p. 147.

Gonidia phycopeltidea. Stylosporæ oblongæ, simplices, decolores, apicibus rotundatis, long. 0.007 ad 0.008, crass. 0.002 mm. Sterigmata simplicia, elongata. Conceptacula pyrenidum fuscofuliginea, integra. Apothecia in collectione Welwitschiana handvisa.

GOLONGO ALTO. —Ad folia perennia arboris prope rivulum Cuango ad basin montis Serra de Alta Queta. No. 313.

3. **Ch. perplexum** Nyl., Prodr. Nov. Gramat. Addit. p. 312; Müll. Arg., Graph. Féean. p. 67.

Ad ramos arboris Spondiadis prope Chinchoxo in territorio Landana lecta a Pechnel-Loesche, teste Müll. Arg., Lich. Afr. Occ. (Linnaea 1880), p. 40 (*Ch. farinaceum*).

4. **Ch. sanguineum** (Sw.) Wain., Etud. Lich. Brés. II, p. 143.

Corticola in planicie secus flumen Quillu lecta a Pechnel-Loesche, teste Müll. Arg., Lich. Afr. Occ. p. 40 (*Ch. rubrocinctum*).

5. **ARTHONIA** (Ach.) Wain.1. **A. (Arthothelium) Angolense** (Nyl.) Wain.

*Tremotylium* Nyl., Lich. Angol. p. 8.

Gonidia chroolepoidea, cellulis cire. 0.010 ad 0.014 mm. crassis. Paraphyses ramoso-connexae, valde intricate, apicibus leviter inerasatis, fuscescentibus. Spore murales, septis transversalibus 9 ad 11. Apothecia in pseudostromatibus aggregata, disco ellipsoideo oblonga aut minore parte rotundata, nigricante aut livido, denum nudata. Peritheciun laterale evanescens.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Euphorbia candelabrum*

in agro Loandensi (nos. 164 pr. p., 212 pr. p., 398 pr. p., 400 pr. p., 461 pr. p.). Ad corticem *Adansonia* (no. 200), et *Euphorbia candelabri* (no. 328 pr. p.) prope Boa Vista. Ad corticem *Euphorbia candelabri* frequenter inter Camama et Calumbo (nos. 211 pr. p., 399 pr. p.). Ad frutices inter Dande et Bengo (no. 449 pr. p.). Ad corticem *Adansonia* in maritimis prope Samba (no. 209) frequenter.

2. **A. lacerata** Wain., sp. n.

Thallus sat tenuis, dispersus laceratusque, quasi lacinias angustissimas elongatas irregularesve formans, glaucescens, opacus, gonidia chroolepoidea (cellulis circ. 0·008 mm.) continens. Apothecia solitaria, rotundato-diformia, 0·6 ad 0·2 mm. lata, verrucis leviter elevatis inclusa, disco carneo-pallido, tenuiter pruinoso. Hymenium jodo persistenter caerulescens. Paraphyses ramoso-connexae. Ascii pyriformes, long. circ. 0·050, crass. circ. 0·034 mm. Sporae 4nae (aut forsitan etiam 8nae), decolores, demum murales, septis transversalibus 5 ad 7, cellulis sa numerosis, long. 0·020 ad 0·028, crass. 0·008 ad 0·012 mm.

BARRA DO BENGU.—Supra folia Citri ad Convento S. Antonio proprium Bengo. No. 317 pr. p.

3. **A. distenta** Wain., sp. n.

Thallus crassitudine medioeris, leviter inaequalis aut sat laevigatus, rimosus, leviter nitidus, glaucescens, hypothallo indistincto. Apothecia sat approximata, irregulariter oblonga ellipsoideave aut rotundata difformiave, long. 1·1 ad 0·4, latit. 0·6 ad 0·4 mm., leviter emergentia, disco fusco-nigro, primum pelliculis parce tecta, dein mox denudata. Hypothecium albidum. Hymenium jodo persistenter caerulescens. Epitheciun rufescens. Ascii ellipsoidei aut ellipsoideo-ovoidei, long. circ. 0·075, crass. 0·055 mm. Sporae 8nae aut pauciores, nigricantes, oblongae, medio leviter constrictae, murales, septis transversalibus circ. 12, long. 0·058 ad 0·078, crass. 0·010 ad 0·011 mm., halone nullo induitae. Ab *A. cyrtode* Tuck. et *A. distendente* Nyl. colore hypothecii et sporarum et apotheciis difformibus differt.

BARRA DO BENGU.—Ad trunco emortuos arboris Mafumeira (i.e. *Ceiba Cuseuria*) prope S. Antonio do Bengo. No. 354.

4. **A. homœophana** Nyl., Prodr. Fl. Nov.-Granat. ed. 2, p. 236; Syn. Lich. Nov. Caled. p. 65; Willey, Syn. Arth. p. 51.

Thallus sat tenuis, sat laevigatus, continuus aut leviter rimosus, albido-glaucens, leviter nitidus. Apothecia partim sat approximata, difformia, long. 1·3 ad 0·5, latit. 0·8 ad 0·4 mm., parum emergentia, disco fusco-nigro, primum pelliculis parce tecto, dein denudato. Hypothecium pallidum. Hymenium jodo vinose rubens aut passim primum levissime caerulescens. Epitheciun rufescens vel rubescens-rufescens, KHO olivaceum. Ascii subglobosi, diam. circ. 0·100 ad 0·066 mm. Spore 8nae (ut videtur), obscuratae, murales, septis transversalibus 5 vel pluribus, long. 0·036 ad 0·060, crass. 0·014 ad 0·022 mm. Vix nisi sporis obscuratis ab *A. macrotheca* Fée differt.

DANDE.—Ad *Rhizophoras* juxta ostia fluminis Lifune. No. 353.

5. **A. Loandensis** Wain., sp. n.

Thallus tenuis, virescens, sat levigatus, continuus aut leviter rimosus, parum nitidus. Apothecia dispersa, difformia, partim subastroidea, long. 1.2 ad 0.3, latit. 0.7 ad 0.2 mm., haud emergentia, disco nigro, denudato. Hypothecium pallidum. Hymenium jodo vinose rubens (haud caeruleo-sens). Epithecium pallido-fuscescens, KHO olivaceum. Ascii subglobosi. Spore Siae, ovoideo-oblongae, demum nigricantes, murales, cellulis paucis, septis transversalibus 7, loculo apicali crassiore reliquis multo longiore, strato gelatinoso induite, long. circ. 0.035, crass. 0.014 mm.

LOANDA (0 ad 1000 ped. s. m.). Ad corticem fruticis prope Teba. No. 465. Gonidia chroolepoidea, parva.

6. **A. (Euarthonia) platygraphidea** Nyl., Lich. Nov.-Gran. ed. 2, p. 235; Müll. Arg., Graph. Fécant. p. 59; Wain., Etud. Lich. Brés. II, p. 151, Lich. Brés. Exs. n. 90.

Apothecia partim suborbicularia, elevata. Hypothecium dilute fuscescens vel pallidum. Epithecium fuscescens. Hymenium jodo intense persistenter caeruleo-sens. Ascii ellipsoideo-ovoidei, apicem versus membrana inerassata, long. circ. 0.070, crass. 0.050 mm. Paraphyses ramoso-connexae. Spore Siae, decolores, fusiformi-oblongae, 10- vel 11-septatae, cellulis 2 mediis reliquis paullo longioribus, long. 0.055 ad 0.065, crass. 0.016 mm. (no. 460).

BARRA DO BENGÓ.—Ad ramulos frutieum prope S. Antonio de Bengo juxta latera vie ex Quifandongo. No. 460.

HUILLA.—Ad ramulos arborum in editoribus (3800 ad 5500 ped. s. m.) montis Serra de Lopollo. No. 462 pr. p.

7. **A. leptogramma** Müll. Arg., Lich. Afr. Oec. p. 39.

Ad corticem emortuum Palmarum secus flumen Quillu lecta a Pehuel-Loesche teste Müll. Arg., l.c.

8. **A. platyspila** Nyl., Lich. Nov.-Gran. ed. 2, p. 230; Willey, Syn. Arth. p. 16.

Hypothecium pallidum, jodo caeruleo-sens. Hymenium jodo persistenter caeruleo-sens, membrana ascorum haud reagens aut levissime violascens, metaplasma rubescens. Epithecium sordide pallidum aut fuscescens. Ascii subglobosi aut ovoidei, long. 0.032 ad 0.046, crass. 0.024 ad 0.030 mm. Spore Siae, fusiformi-oblongae, apicibus obtusis, decolores, cellulis 2 mediis paullo longioribus aut sat aequalibus, long. 0.019 ad 0.030, 0.006 ad 0.008 mm., 5—7-septatae. Gonidia chroolepoidea, cellulis circ. 0.006—0.008 mm. crassis.

AMBRIZ.—Ad corticem fruticis in fuga ex Mossul ad Barra do Dande lectum. No. 239.

LOANDA (0 ad 1000 ped. s. m.).—Ad *Adansoniæ* (no. 453) et *Rhizophoræ* (no. 337). Ad corticem *Euphorbia corollata* in collinis maritimis (no. 320) et ad ramulos frutieum *Cordia*, *Balsamodendri*, *Rubiacearum* et *Verbenacearum* in collinis prope Boa Vista (no. 334).

9. **A. Loangana** Müll. Arg., Lich. Afr. Oec. p. 38.

*A. Loanduna* Müll. Arg., Lich. Montev. p. 5 (errat.).

Palmicola secus flumen Quillu lecta a Pechuel-Loesche, teste Müll. Arg., *l.c.*

10. **A. gregaria** (Weig.) Körb.

Var. **tumidula** (Ach.) Almq., Mon. Arth. Scand. p. 163: Wain., Etud. Lich. Brés. II. p. 163.

Thallus albidus aut cinerascens. Apothecia anguloso-rotundata, disco cæsio-pruinoso, margine coccineo.

AMBACA.—Ad truncos *Natiosia* prope Puri-Cacarambola. No. 330 pr. p.

GOLUNGO ALTO.—Ad corticem arboris Euphorbiaceæ in sylvis editis (2200 ped. s. m.) in Sovado de Quilombo. No. 321. Non infrequens ad truncos *Lophostyliidis* (i.e. *Securidava Welwitschii*) in sylvis primitivis ad Alta Queta. No. 323 pr. p. (255 pr. p.). Ad corticem *Acacia* prope Camilungo. No. 338 pr. p.

Var. **adspersa** (Mont.) Wain., *l.c.* *Leiogramma tenellum* Eschw. in Mart. Fl. Bras. (1833), p. 101, teste Müll. Arg., Fl. 1888, p. 524 (at disco nigro describitur). *A. gregaria* v. *pruinata* Del. in Nyl., Prodr. Lich. Gall. p. 164.

Thallus albidus aut cinerascens. Apothecia anguloso-rotundata, disco cæbrius aut tenuius albido- vel cæsio-pruinoso, margine albido- vel cæsio-pruinoso.

GOLUNGO ALTO.—Ad Spondiaceas prope Sange (no. 329 pr. p.) et Trombeta (no. 333). Ad truncos vetustos *Acacia* prope Camilungo (no. 338 pr. p.). Ad corticem *Drucinae* prope Carengue (no. 324 pr. p.). Ad truncos arboris Artocarpeæ in sylvis primævis in Serra de Alta Queta (no. 331). Ad truncos prope Cacarambola (no. 452).

Var. **kermesina** (Schær.) Nyl., Lich. Scand. p. 257; Willey. Syn. Arth. p. 7.

Thallus plus minusve coccineo-pruinosis. Apothecia anguloso-rotundata aut partim oblonga, disco cæsio-pruinoso, margine coccineo-pruinoso. Hymenium jodo intense persistenter cærulescens. Asci pyriformes. Sporæ decolores, 4- vel 5-septatae, long. 0.014, crass. 0.0045 ad 0.009 mm.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Euphorbia candelabri* prope Boa Vista. No. 328 pr. p. Transit in var. *speciosam*, quacum crescit.

Var. **speciosa** Müll. Arg., Lich. Usambar. (1894), p. 286.

Thallus plus minusve coccineo-pruinosis. Apothecia partim elongata, simplicia aut parce ramosa, disco primum coccineo-pruinoso, dein denudato nigricanteque, margine coccineo-pruinoso. Hymenium jodo cærulescens, dein vinose rubens. Sporæ 8næ, sæpe demum nigricantes, 2—4-septatae, long. 0.013 ad 0.016, crass. 0.005 ad 0.006 mm.

LOANDA (0 ad 1000 ped. s. m.).—Ad ramulos *Sterculia* in collinis sabulosis agri Loandensis. No. 332. Ad ramos *Adansonia* in nemore maritimo prope Samba. No. 325. Ad truncos *Adansonia* prope Represa do Manoel Pereira. No. 327 pr. p. Ad corticem *Adansonia* (no. 326), *Euphorbia candelabri* (no. 328 pr. p.), *Balsamodendri* (nos. 361 pr. p., 336 pr. p.) prope Boa Vista. Ad corticem *Adansonia* prope Praia de Zamba. No. 369 pr. p.

Var. **reducta** Wain.

Thallus albidus aut passim dilute roseus. Apothecia elongata, angusta, circ. 0.1 ad 0.15 mm. lata, substellato ramosa aut partim simplicia, disco denudato nigricanteque, margine coccineo-pruinoso. Hymenium jodo vinose rubens. Ascii pyriformes, long. circ. 0.046, latit. 0.028 mm. Spore decolorata, vulgo 3-septatae, parca 4-septatae, long. 0.016 ad 0.020, crass. 0.003 ad 0.006 mm.

BARRA DO BENGÓ.—Ad ramulos semiherbaceos inter S. Antonio de Bengo et Quifandongo. No. 322.

Var. **rimata** Wain.

Thallus plus minusve coccineo-pruinosus. Apothecia oblonga, opegraphoidea, margine elevata, nigricante, denudata, disco impresso, dilatata-rimataformi, nigricante, denudata. Hymenium jodo persistenter caeruleo-virescens. Ascii pyriformes. Spore 8nae, decolorata, ovoideo-oblonga, vulgo 5-septatae, parca 6-septatae, cellulis 2 mediis quam reliquis paullo longioribus aut cellulis aequalibus, long. 0.017 ad 0.022, crass. 0.005 ad 0.006 mm.

BENGUELLA.—Ad ramulos *Acacia etbaica* in sylvestribus non procul ab oceano prope Bengella. No. 3.

Var. **medusæformis** Wain.

Thallus albidus. Apothecia elongata, crebre et abundanter radiato-ramosa, disco plano fuscescente, tenuissime griseo-fuscescenti-pruinosus, margine indistincto, passim maculis dilute roseis circumdata. Hymenium jodo persistenter caeruleo-virescens, ascis violaceo-virescentibus. Spore 8nae, 3—4-septatae, cellula apicali quam reliquis duplo longiore, long. 0.016 ad 0.018, crass. 0.005 ad 0.007 mm. Epithecium intense coccineum. Hypothecium dilutius coccineum.

LOANDA (0 ad 1000 ped. s. m.). Ad trunco *Adansonia digitata* prope Represa do Manoel Pereira. No. 327 pr. p.

Var. **obscura** Scher.; Koerb., Syst. Germ. p. 291. *Comia corporum gregarium*  $\beta$  *obscurum* Scher., Lich. Helv. Exs. n. 649; Mass., Summ. Animadv. (1853), p. 13; Hepp, Flecht. Eur. n. 163.

Thallus vulgo livido-cinerascens. Apothecia nigra, diformia, brevia, nuda.

GOLUNGO ALTO.—Ad corticem *Eutandrophragmatis angolensis* prope Sange. No. 469. Peritheciu laterale (sub microscopio visum) coccineum. Ascii elevati, latit. circ. 0.022 mm. Spore decolorata aut dilute fuscescentes, long. 0.024 ad 0.026, crass. 0.009 ad 0.010 mm., 4—5-septatae.

II. **A. rubella** (Fée) Nyl., Syn. Arth. p. 89; Müll. Arg., Graph. Féean. p. 56; Willey, Syn. Arth. p. 11.

Hymenium jodo persistenter caeruleo-virescens, ascis pr. p. dilute violaceo-virescentibus. Epithecium sordide subrubescens. Hypothecium pallidum. Ascii ellipsoideo-ovoideo, long. circ. 0.050, crass. 0.010 mm. Spore 8nae, decolorata aut demum dilute nigricantes, 3—5-septatae, cellula apicali quam reliquis duplo longiore, long. 0.026 ad 0.033, crass. 0.011 ad 0.012 mm.

AMBRIZ.—Ad truncum *Elaeis guineensis*. No. 360 pr. p.

**NÆVIA** Fr.

Hoc genus, defectu gonidiorum ab *Arthonia* differens, ad fungos pertinet.

1. **N. euphorbiæ** Wain., sp. n.

Thallus macula cinereo-albida indicatus, linea nigricante partim limitatus, gonidiis carens. Apothecia sat dispersa, difformia, long. et latit. circ. 0·7 ad 0·2 mm., demum saepe centro emorientia, parum emergentia, disco nigro, nudo, planiusculo. Hypothecium albidum. Hymenium jodo non reagens, membrana ascorum levissime rosea, metaplasma rubescens. Paraphyses ramoso-connexæ, apicem versum sensim incrassatae smaragdulaeque. Epithecum olivaceo-smaragdulum, KHO non reagens. Ascii subglobosi, long. 0·030 ad 0·032, crass. 0·026 mm., apice membrana incrassata. Sporæ 8næ, decolores, ovoideo-oblongæ, 4-septatae aut parcus etiam 3-septatae, cellulis æqualibus, long. 0·010 ad 0·015, crass. 0·004 ad 0·005 mm., halone nullo.

LOANDA (0 ad 1000 ped. s. m.).—Ad trunco vigente *Euphorbia candelabri* prope Boa Vista. No. 350 pr. p.

2. **N. parallela** Wain., sp. n.

Thallus macula albida indicatus, gonidiis carens. Apothecia inter fibras ligni erumpentia, elongata, long. 1 ad 0·3, latit. 0·1 mm., recta, parallela, disco nigricante, nudo. Hypothecium pallidum. Hymenium jodo violaceens. Epithecum olivaceo-smaragdulum aut sordide smaragdulum. Paraphyses ramoso-connexæ. Ascii primum obovoidei, demum ellipsoidei, long. circ. 0·032, crass. 0·016 mm., apice membrana incrassata. Sporæ 8næ, decolores, ovoideæ aut ovoideo-oblongæ, 3-septatae, cellula latiore apicali quam reliquis paullo longiore, aut cellulis sat æqualibus, long. 0·011 ad 0·014, crass. 0·005 mm., halone nullo. Cum *A. stictoide* (Desm.) et *A. xylographica* Nyl. comparabilis. Habitu vix differt a *Xylographa parallela*.

BENGO.—Ad lignum vetustum in ramo fruticis inter Dande et Bengo, una cum *A. Anguleusi*. No. 449 pr. p.

3. **N. rotundata** Wain., sp. n.

Thallus parum distinctus, gonidiis destitutus. Apothecia e substrato leviter emergentia, rotundata (diam. 0·25 ad 0·2 mm.) aut parcus ellipsoidea (long. 0·4, latit. 0·2 mm.), disco nigricante nudo planiusculo aut leviter convexo. Hypothecium pallidum. Hymenium circ. 0·050 mm. crassum, jodo leviter cærulescens, dein vinose rubens. Epithecum smaragdulo-fuligineum, KHO non reagens. Paraphyses parce apice ramoso-connexæ. Ascii clavati, long. circ. 0·040, crass. 0·014 mm., apice membrana inerassata. Sporæ 8næ, decolores, distichæ, ovoideo-fusiformes aut oblongæ, 3-septatae, loculis æqualibus, long. 0·011 ad 0·012, crass. 0·003 ad 0·004 mm. Excipulum basi pallidum, latere smaragdulo-fuligineum. KHO non reagens, circ. 0·040 mm. crassum. *Arthonia mediella* ab hac specie epithecio et hypothecio fuscescente differt et *N. punctiformis* ascis latioribus et reactione hymenii ab ea recedit.

MOSSAMEDES (0 ad 1000 ped. s. m.).—Ad caules *Zygophylli orbiculatae* Welw. prope Mossamedes. No. 423.

4. **N. Benguellensis** Wain., sp. n.

Thallus parum distinctus, circa apothecia ex hyphis nigri cantibus formatus, gonidiis destitutus. Apothecia sat dispersa, irregulariter ellipsoidea, long. 1.3 ad 0.7, latit. 0.7 ad 0.3 mm., emergentia, disco nigro, nudo, leviter convexo. Hypothecium et epithecium et lamina tota apothecii olivaceo-smaragdula. Hymenium jodo persistenter caeruleo-vires. Ascii elevati, long, circ. 0.030, crass. 0.010 mm., parte superiore presertimque apicem versus membrana incrassata. Sporee 8nae, distichae, decolores, ovoides-oblongae, long. 0.009 ad 0.012, crass. 0.003 mm., 2-septatae.

BENGUELLA. Ad lignum sepium in ipsa urbe Benguella. No. 20

II. PYRENOLICHENES.

1. **ENDOCARPON** Hedw.

1. **E. pusillum** Hedw., Deser. Muse. ii, fasc. 2 (1788), p. 56.

*Dermatocarpon* Arn., Lich. Jur. p. 239, Lich. Tirol. xxx, p. 31. *Verrucaria Garoraylii* (Mont.) Nyl., Lich. Angol. p. 14. *Thelotrema Schorreri* Hepp, Flecht. Eur. n. 100.

GOLUNGO ALTO.—Ad terram arenosam juxta margines sylvæ in monte Cungulungulo (2500 ped. s. m.) plagas latas obtegens sat frequenter obvenit. No. 55.

Specimina determinabilia non vidi.

2. **THELENELLA** (Nyl.) Wain.

1. **Th.** (subg. **Meristosporum** sect. *Phlobothelium*) **purpurina** (Leight.) Wain.

*Trypethelium purpurinum* Leight., Lich. Amaz. p. 459. *Bathelium* Müll. Arg., Lich. Afr. Occ. p. 45.

Corticola scens flumen Quillu leg. Pechuel-Loesche, teste Müll. Arg., *i.e.*

2. **Th.** (subgen. **Euthelenella** sect. *Microlyloma*) **fulva** Wain., sp. n.

Thallus sat tenuis aut mediocris, pulchre fulvescens, continuus, sat levigatus aut verrucoso-inaequalis, nitidiusculus, hypothallo parum distincto. Apothecia verrucas 1.5 ad 1 mm. latas, mammiformes, basi haud constrictas, strato thallino thallo concolore late obductas, vertice 0.4 ad 0.6 mm. lato denudato, nigricante aut primum cineraseente, umbonato aut denum applanato instructas formantia, solitaria aut rarius parce confluentia. Peritheciun globosum, fuligineum, integrum. Nucleus jedo non reagens, gonidia hymenialia non continens. Paraphyses increbre ramoso-commixae. Sporee 4nae, decolores, oblongae, apicibus rotundatis, murales, cellulis numerosissimis, halone indutæ, long. circ. 0.190 ad 0.220, crass. 0.030 mm. Gonidia chroolepoidea. Stratum corticale thalli amorphum, bene evolutum.

GOLUNGO ALTO.—Ad *Citrum Medium* silvestrem prope Mata Quisneulo. No. 230.

Affinis sit *Th. duplexcavata* (Nyl.) Wain. (Nyl., Lich. Andam. p. 19).

3. **PARMENTARIA** Fée.

1. **P. astroidea** Fée, Ess. Crypt. Ecoc. (1824), p. 70, Müll. Arg., Pyr. Féean. p. 7.

*Pyrenastrum Americanum* Spreng., Linn. Syst. Veg. iv. (1827), p. 248; Stizenb., Lich. Afr. p. 232. *Heugleria pentagastrica* Müll. Arg., Lich. Afr. Occ. p. 45 (Lich. Beitr. n. 592, 826).

Ad corticem arborum prope flumen Quillu leg. Pechuel-Loesche.

4. **BOTTARIA** (Mass.) Wain.

1. **B. (subg. Anthracothecium) epapillata** (Nyl.) Wain.

*Verrucaria* Nyl., Exp. Pyrenocarp. p. 43, Prodr. Fl. Nov.-Granat. Addit. p. 344.

GOLUNGO ALTO.—Ad corticem *Adansonia* (no. 231) et Spondiacearum (no. 329) prope Sange. Ad corticem *Entandrophragmatis angolensis* (no. 250).

Thallus pallidus. Apothecia verrucas 1 ad 1.2 mm. latas strato thallino crasso aut tenui obductas, vertice interdum demum denudatas. aequaliter convexas, bene elevatas aut depresso-hemisphaericas formantia. Peritheciū globosum, integrum, fuligineum, columella nulla. Spore binæ, murales, fuscescentes, strato gelatinoso indutæ, long. 0.120 ad 0.185, crass. 0.030 ad 0.048 mm., oblongæ, apicibus rotundatis. Paraphyses maxima parte simplices, parcissime etiam ramoso-connexæ.

2. **B. (Anthracothecium) thelomorpha** (Tuck.) Wain.

*Pyrenula* Tuck., Gen. Lich. p. 275, Syn. North Am. Lich. ii. p. 141.

Thallus albidus aut raro partim flavidio-pallescens (in no. 462), tenuis, endophleoides. Apothecia verrucas diu depresso-hemisphaericas, demum elevatas, 0.4 ad 0.5 mm. latas, diu fere totas strato thallino, thallo concolor, obductas, demum plus minusve late apice denudatas nigricantesque, vertice convexo aut rarius conoideo instructas formantia. Peritheciū fuligineum, basi tenue aut deficiens, latere haud dilatata, subglobose bene depresso vel fere hemisphaericum. Paraphyses simplices aut ad latera parce ramosæ. Spore 8na, ellipsoideæ, nigricantes, murales, septis transversalibus 3 ad 5, long. 0.022 ad 0.028, crass. 0.009 ad 0.012 mm. Nucleus jodo non reagens.

AMBRIZ.—Ad corticem Spondiacearum prope Ambriz. No. 65 pr. p. LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Balsamodendri* prope Maianga do Povo. No. 103 pr. p. Ad corticem Spondiacearum in Praia de Zamba Grande. Nos. 233 pr. p., 234.

HUILLA (3800 ad 5500 ped. s. m.).—Ad ramulos arborum in monte Serra de Lopollo. No. 462.

5. **PYRENULA** (Fée) Wain.

1. **P. (subg. Melanotheca) Achariana** (Fée) Wain.

*Melanotheca* Fée, Ess. Crypt. Ecoc. Suppl. p. 41; Müll. Arg., Pyr. Cub. p. 396, Pyr. Féean. p. 18. *Trypethelium anomalam* Ach., Syn. Lich. p. 105 pr. p. (conf. Müll. Arg., Lich. Beitr. n. 845); Hue, Nyl. Lich. Exot., p. 299.

GOLUNGO ALTO.—Ad corticem arboris. No. 248 pr. p. Ad corticem Euphorbiacearum in regione sylvatica edita ad Sovado de Quilombo.

No. 187. Ad corticem *Entandrophragmatis angolensis* in sylvis primitivis prope Sange. No. 205. Ad corticem *Zanthoxyl* in monte Alta Queta. No. 339 pr. p.

Sporae 8nae, 3-septatae, nigricantes, long. 0.017 ad 0.019, crass. 0.0055 ad 0.008 mm., loculis lenticularibus. Paraphyses simplices. Peritheciun basi deficiens (in no. 187), cavitate depresso-conoideo-subglobosa aut fere hemisphaerica. No. 205 ad var. *Angolense* Wain. pertinet, pseudostromatibus temnioribus et ostiolo minore, haud pallide annulato dignotam. Incertum est,anne cum *P. Achatriana* confluit.

2. **P. (subg. *Eupyrenula* sect. *Dimidiata*) *conica*** Müll. Arg., Lieb. Afr. Occ., p. 43.

Ad corticem arboris prope flumen Quillu leg. Soyanx, teste Müll. Arg., *i.e.*

3. **P. *fuscolurida*** Wain., sp. n.

Thallus endophloeodes, macula fuscescente vel partim testaceo-fuscescente indicatus, laevigatus, hypothallo nigricante limitatus. Apothecia verrucas 0.5 ad 0.8 mm. latas, depresso-hemisphaericas, nigras vel fusco-nigras, subnudas, opacas, vertice convexas aut demum umbonatas formantia. Peritheciun fuligineum, basi deficiens, hemisphaerium, latere anguste alato-dilatatum. Sporae 8nae, oblique monostichae, 3-septatae, loculis sat aequalibus, fuscescentes, long. 0.014 ad 0.017, crass. 0.006 ad 0.007 mm., apicibus obtusis.

SIERRA LEONE.—Ad corticem arboris "Hog-Plum" (*i.e. Spondias Mombin* L.), prope Freetown cultae. No. 247 pr. p.

4. **P. *parva*** Wain., sp. n.

Thallus endophloeodes, maeula albida aut albido-pallescensente indicatus, laevigatus, hypothallo nigricante limitatus. Apothecia verrucas 0.2 ad 0.25 mm. latas, depresso-hemisphaericas aut hemisphaericas, nigras, opacas, strato thallino tenuissimo amorpho pellucido obductas, vertice convexas formantia. Peritheciun fuligineum, dimidiatum, basi deficiens, haud alatum. Sporae 8nae, distichae, 3-septatae, loculis sat aequalibus aut apicalibus difformibus, pallide aut demum etiam obscuratae, long. 0.014 ad 0.016, crass. 0.005 ad 0.006, apicibus obtusis.

SIERRA LEONE.—Ad corticem arboris "Hog-Plum," prope Freetown cultae, cum specie precedente. No. 247 pr. p.

5. **P. (sect. *Pyramidalis*) *eucalypta*** Wain., sp. n.

Thallus tenuis, pallidus, laevigatus, hypothallo indistinetu. Apothecia verrucas 0.7 (ad 0.5) mm. latas, hemisphaericas aut depresso-hemisphaericas, nigras, strato thallino tenuissimo amorpho pellucido obductas, vertice convexas aut rarius leviter umbonatas formantia. Peritheciun fuligineum, compressum, basi tenui leviter convexum, latere anguste alato-dilatatum. Sporae 8nae aut aborti pauciores, fuscescentes, 3-septatae, long. 0.030 ad 0.036, crass. 0.014 ad 0.016 mm., apicibus obtusis, loculi apicales intermediis paullo minores.

GOLUNGO ALTO.—Ad corticem *Fici* (Quibebe *i.e. F. Quibebe* Welw.) prope Luinba. No. 213 pr. p.

5. **P. Trombetana** Wain., sp. n.

Thallus endophloeodes, griseo-pallescens, levigatus, hypothallo indistincto. Apothecia verrucas 0·6 ad 0·5 mm. latas, hemisphaericas, nigras, basin versus strato thallino tenui subpellucido obductas, vertice convexas aut pro parte leviter umbonatas formantia. Perithecium fuligineum, compressum, basi tenui leviter convexum, latere acutatum, at hanc alatum. Nucleus lateribus rotundato-obtusis. Sporae 8nae, distichae, fuscescentes, 3-septatae, long. 0·036 (ad 0·025), crass. 0·015 (ad 0·011) mm., apicibus obtusis, loculi apicales intermediis paullo minores.

GOLUNGO ALTO (1000 ad 2000 ped. s. m.).—Ad corticem Leguminosarum prope Trombeta. No. 124.

7. **P. (sect. Subglobosa) acaciæ** Wain., sp. n.

Thallus tenuis, albido-pallescens, parum distincte gibberosus vel verruculis minutissimis sparsis instructus, hypothallo indistincto. Apothecia verrucas 1 ad 0·7 mm. latas, hemisphaericas, cinereo-nigricantes, strato thallino tenui, leviter pellucido aut rarius impellucido obductas aut raro apice leviter denudatas, vertice convexas formantia. Perithecium fuligineum, subglobosum, integrum. Sporae 8nae aut abortu pauciores, distichae, fuscescentes, 3-septatae, long. 0·036 ad 0·042, crass. 0·016 ad 0·018 mm., apicibus obtusis, loculi apicales intermediis paullo minores.

GOLUNGO ALTO.—Ad corticem *Acacia* in sylvis prope Mussangue. No. 236.

8. **P. oculifera** Wain., sp. n.

Thallus sat tenuis, pallidus, sat levigatus, hypothallo nullo distincto. Apothecia verrucas 0·7 ad 0·9 mm. latas, hemisphaericus, strato thallino, thallo concolore, crassiusculo, circa verticem cinereo-nigricantem abrupte limitato majore parte inferiore vestitas, vertice strato thallino tenuissimo subpellucido obducto 0·4 ad 0·3 mm. lato saepe leviter impresso et ostiolo leviter umbonato instructas formantia. Perithecium fuligineum, subglobosum, basi tenui. Sporae 8nae aut abortu pauciores, 3-septatae, fuscescentes, long. 0·030 ad 0·038, crass. 0·012 ad 0·015 mm., loculi apicales intermediis minores.

AMBACA.—Ad corticem arbustuli prope Puri-cacarambola. No. 237.

9. **P. gibberosa** Wain., sp. n.

Thallus crassitudine medioeris, fulvescenti-pallidus, continuus, bene gibberosus sive verruculis minutis (circ. 0·1 ad 0·3 mm. latis) irregulariter depresso-hemisphaericis thallo paullo pallidioribus sat crebre instructus, hypothallo parum distincto. Apothecia thallo immersa et solum ostiolo obscurato hanc aut parum umbonato-elevato indicata, demum verrucas leviter elevatas, strato thallino thallo consimili circa verticem fusconigricantem denudatum 0·4 mm. latum convexum distincte limitato parte inferiore obductas formantia. Perithecium fuligineum, depresso-subglobosum, 0·7 ad 0·8 mm. latum, basi tenui. Sporae 8nae, monostichae (aut spora una distiche disposita), 3-septatae, fusce-

scentes, long. 0.022 ad 0.034, crass. 0.011 ad 0.014 mm., apicibus obtusis, loculi apicales intermediae minores.

GOLUNGO ALTO.—Ad corticem *Fici* (Quibebe). No. 252 pr. p. Ad corticem arboris in summo monte Cungulungulo. No. 254. Ad corticem arborum in sylvis primitivis prope Sange. No. 458 pr. p.

#### 10. **P. euphorbiæ** Wain., sp. n.

Thallus tenuis, olivaceo-pallidus vel isabellinus, minutissime gibbosus sive verruculis punetiformibus (circa 0.05 mm. latis), solum lente visibilis, thallo pallidioribus sat crebre instructus, hypothallo nigro parce angusteque limitatus. Apothecia thallo immersa, denum macula olivaceo-nigricante indicate, apice denum vix emergente strato thallino semipellucido obducto instructa. Peritheciun fuligineum, integrum, subglobosum, 0.015 ad 0.3 mm. latum. Sporæ 8nae, distichæ, 3-septatae, fuscescentes, long. 0.017 ad 0.024, crass. 0.009 ad 0.010 mm., apicibus obtusis, loculis sat aequalibus aut apicalibus minoribus.

AMBRIZ.—Ad truncos emortuos *Euphorbia* in sylvis primævis inter Ambriz et Quizembo. No. 223.

#### 6. **ASTROTHELIUM** (Eschw.) Trev.

##### 1. **A. isabellinum** Wain., sp. n.

Thallus sat tenuis aut medioeris, isabellino-pallescens, levigatus, KHO leviter fulvescens, hypothallo indistineto. Apothecia thallo substratoque immersa, vertice circa 0.5 ad 0.3 mm. lato denudato nigricante convexa et leviter emergentia, circulos circa 2 mm. latos ex 8 vel paucioribus peritheciis aggregatis vel leviter confluentibus circa ostiolum commune strato thallino circumdata formantia. Peritheciun fuligineum, hemisphericum, basi tenue applatumque. Nucleus jodo caerulescens et denum vinose rubens. Paraphyses neque ramosæ, nec connexæ, gelatinam abundantem percurrentes. Sporæ 8nae, oblique monostichæ, decolores, 3-septatae, apicibus obtusis, long. 0.010 ad 0.015, crass. 0.005 ad 0.006 mm., loculi lenticulares sat aequales aut apicales intermediae paullo minores.

GOLUNGO ALTO.—Ad corticem arbusculi *Cynometra lacistema* in monte Serra de Alta Queta. No. 193.

#### 7. **PSEUDOPYRENULA** (Müll. Arg.) Wain.

##### 1. **Ps. (Trypethelium) eluteriæ** (Spreng.) Wain., Etud. Lich. Brés. II. p. 204.

*Trypethelium Sprengelii* Ach., Lich. Univ. p. 306.

GOLUNGO ALTO.—Ad truncos arborum in sylvis primitivis. No. 188. Ad corticem *Spondiadis* (no. 196), *Zanthoxylis* (no. 202), *Sponia* (*Celtis Soyanii*) (nos. 203, 204) in sylvis prope Sange. Ad truncos *Milletia* prope Trombeta. Nos. 201b, 205b, 206 pr. p. Ad truncos arborum in sylvis ad Cungulungulo. Nos. 198, 342 pr. p.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Spondiadis* prope Baia de Zamba Grande. No. 197. Sat frequenter ad corticem arborum et fruticum in collibus littoralibus prope Alto da Boa Vista. Nos. 194 pr. p., 222 pr. p. Non infrequens ad ramulos fruticum inter Teba et Cacuaco. No. 195 pr. p.

LIBONGO.—Ad corticem *Rhizophore* prope flumen Lifune. No. 367.

DANDE.—Ad truncos arborum juxta ripas fluminis Lifune. No. 199 pr. p.

Conceptacula pycnoconidiorum verruculas hemisphaericas 0·2 ad 0·15 mm. latae, crebre aggregatas, parce etiam confluentes, obscure cinerascentes, parcius etiam fulvescenti-maculatas, apice demum nigricantes, materiam fulvam continentis formantia. Pycnoconidia recta, apicibus ambobus clavato-incrassatis rotundatis guttulam oleosam saepe continentibus, simplicia, long. 0·005 ad 0·006, crass. 0·001 ad 0·0007 mm.

2. **\*Ps. subsulphurea** Wain., Etud. Lich. Brés. II. p. 205.

GOLUNGO ALTO.—Ad truncos vigentes *Milletiae* prope Trombeta. No. 206 pr. p.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem arborum et fruticum in collibus littoralibus prope Alto da Boa Vista. Nos. 195 pr. p., 222 pr. p.

3. **Ps. (Trypethelium) pustulata** Wain., sp. n.

Thallus sat crassus, olivaceo-glaucescens, irregulariter inaequalis, nitidiusculus, hypothallo nullo distincto. Pseudostromata elevata (circ. 2 ad 1·5 mm. alta), subgloboso-hemisphaerica, basi abrupta aut passim leviter constricta, 2 ad 3·5 mm. lata, thallo obducta et thallo concoloria, KHO non reagentia, perithecia 2 ad 6 substrato separata incurrentia. Perithecium subglobosum, fusco-nigrum, integrum, tenui, ostiolo recte aut oblique disposito, in superficie pseudostromatis punetum nigrum circ. 0·2 mm. latum, neque umbonatum, nec impressum formante. Nucleus jodo non reagens. Paraphyses ramoso-connexae, gelatinam copiosam percurrentes. Sporae 8næ, oblongæ, apicibus obtusis, 7—5-septatae, levissime obscuratae, long. circ. 0·188, crass. 0·042 mm., membrana bene gelatinoso incrassata, strato firmiore sat tenui cavitates subglobosas circumdante, in KHO e partibus gelatinosis secedente, ita ut loculi cellulas omnino liberas formant.

AMBRIZ.—Ad truncum vetustum sed vigentem arboris N-cumbi dictae (i.e. *Calesium antiscorbutica*) prope Ambriz. No. 190.

4. **Ps. (Trypethelium) sphærocephala** Wain., sp. n.

Thallus sat tenuis, pallidus, tenuissime sulphureo-albido-pruinosus, levigatus, hypothallo nigricante partim limitatus. Pseudostromata elevata (circ. 1 mm. alta), subglobosa aut subgloboso-tuberosa, circ. 0·8 ad 1·5 mm. lata, basi bene constricta strato thallino tenui sulphureo-albido-pruinoso obducta aut parte superiore demum leviter denudata nigricantiaque et tunc macula sulphureo-pallida rotundata 0·5 ad 0·4 mm. lata circa quodvis ostiolum (circ. 0·05 mm. latum) instructa, perithecia 6 ad 2 (rarius solitaria) confluentia, extus tuberculo indicata, incurrentia, materiam KHO reagentem non continentia. Perithecium fuligineum, integrum, globosum. Sporae 8næ, decolores, oblongæ, pluriseptatae (13-septatae), loculis lenticularibus, long. circ. 0·080 ad 0·085, crass. 0·014 ad 0·018 mm., halone nullo indutæ.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem *Stereulie* prope Cacuaco. No. 191.

5. **Ps. (Trypethelium) ochroleuca** (Eschw.) Wain., Etud. Lich. Brés. II, p. 209.

Var. **effusa** Müll. Arg., Pyr. Cub. p. 392 (em.), Wain. *l.c.*

**GOLUNGO ALTO**.—Ad truncos vigentes in sylvis primitivis ad Cungulungulo. No. 200. Ad Caretete (i.e. *Phyllanthus discoidalis* Müll. Arg.) locis editis prope Quilombo Quiacatubia. No. 192.

6. **Ps. (Trypethelium) tropica** (Ach.) Müll. Arg.; Wain., Etud. Lich. Brés. II, p. 210.

**BENGO**.—Ad corticem *Fici* prope Bengo. No. 215. Ad corticem variarum arborum inter Quifandongo et Barra do Bengo. No. 221.

**ZENZA DO GOLUNGO**.—Supra truncos Leguminosarum ad margines flumini Calucala. No. 218.

**GOLUNGO ALTO**.—Ad corticem *Fici* prope Luinha. No. 213. Ad truncos *Zygia* (*Albizia*) in sylvis primitivis prope Trombeta. No. 249. Ad truncos *Fici* et *Spondias* prope Sange et Bango-Aquitamba. Nos. 344 pr. p., 217. Ad truncos *Melia* (Bombolo) in sylvis primitivis et in monte Cungulungulo. Nos. 201 pr. p., 251 (214, 226, 383 pr. p.). Purieacarambola, ad corticem arboris. No. 227.

**LOANDA** (0 ad 1000 ped. s. m.).—Ad corticem *Spondias* in Zamba Grande. No. 216. Ad corticem arborum in collibus littoralibus prope Boa Vista. Nos. 194 pr. p., 222 pr. p.

**BARRO DO DANDE**.—Ad Spondiaceas et Rhizophoras juxta ripas fluminis Lifune. Nos. 199 pr. p., 219 pr. p., 220.

7. **Ps. (Heterothelium) Bengoana** Wain., sp. n.

Thallus epiphleoides, tenuis, albidus, levigatus, opacus, hypothallo nullo distincto aut partim nigricante limitatus, K H O non reagens. Apothecia solitaria, numerosa, verrueas 0·25 ad 0·2 mm. latas, hemisphaericas, nigras denudatasque aut basi anguste strato thallino obductas formantia, ostiolo leviter impresso. Perithecium fuligineum, dimidiatum, lateribus rotundatis, basi deficiens. Paraphyses ramoso-connexae, numerosae. Ascii subcylindrici, long. 0·040, crass. 0·012 mm. Nucleus albus, jodo non reagens (metaplasma ascorum jodo rubescens). Spore *Sua*, disticte, oblongae aut ovoideo-oblongae, decolores, long. 0·016 ad 0·020, crass. 0·004 ad 0·006 mm., 3-septatae, loculis lenticularibus, sat aequalibus. Affinis est *Ps. diversa* (Nyl.).

**BENGO**.—Ad ramicos arboris prope Quifandongo. No. 437.

8. **PORINA** (Ach.) Wain.

1. **P. (Segestria) nucalis** Wain., sp. n.

Thallus sat tenuis, gibberosus sive verruculis minutissimis (circ. 0·1 ad 0·05 mm. lati) crebre inspersus, glaucescens vel cinereo-glaucescens, parum nitidus, hypothallo nigricante partim limitatus. Apothecia verrueas 0·5 ad 0·4 mm. latas, elevato-hemisphaericas aut rarius denum depresso-subglobosas, basi abruptas aut rarius leviter constrictas, amphithecio thallino tenui primum obductas, vertice convexo denum denudatas pallidasque, ostiolo vulgo leviter umboato vix 0·1 mm. lato rufescente aut fuso-rufescente instructas formante. Perithecium pallidum, globosum. Paraphyses simplices. Spore *Sua*, decolores, fusi formes, apicibus obtusis, 7—5-septatae, loculis aequalibus, strato

gelatinoso crasso indutæ, long. 0·042 ad 0·046, crass. 0·012 mm. (strato gelatinoso non computato). *P. nuculæ* Ach. est affinis, at apotheciis apice haud impressis et sporis minoribus ab ea differens.

SIERRA LEONE.—Ad truncos vigentes arboris "Hog-Plum" (i.e. *Spondias Mombin* L.) cultæ prope Freetown. No. 235.

2. **P. tetraceræ** (Ach.) Müll. Arg., Pyr. Cub. p. 401; Wain., Etud. Lich. Brés. II. p. 223.

*Verrucaria Tetracere* Ach., Meth. Lich. p. 121.

CAZENGO.—Ad ramulos *Alsocleia* in dumetosis ad flumen Luinha. No. 246. Spore in hoc specimine long. 0·032 ad 0·040, crass. 0·005 ad 0·007 mm., fusiformes, 7-septatae, strato gelatinoso nullo. Apothecia ostiolo fuscescente. Thallus sat tenuis, glaucescens, arcte adnatus, haud desquamescens. Hypothallus parum distinctus. Dicatur var. **adnata** Wain. Forsan non est autonoma species, quamquam thallo a *P. tetracere* differens, et intermedia inter *P. tetracere* et *P. variegatum* Fée est. Etiam Wain. Lich. Bras. Exsicc. n. 459 et 507 intermedii inter has species sunt, magis cum posteriore congruentes. Transire ita hæ species videntur.

3. **P. desquamescens** Fée, Ess. Crypt. Ecore. Suppl. p. 75; Müll. Arg., Lich. Afr. Occ. p. 41; Wain., Etud. Lich. Brés. II. p. 222.

Corticola ad flumen Quillu (leg. Pechuel-Loesche) et prope Pungo Andongo in Angola (leg. Soyaux), teste Müll. Arg., *l.c.*

4. **P. Africana** Müll. Arg., Lich. Afr. Occ. p. 41.

Corticola ad flumen Quillu leg. Pechuel-Loesche, teste Müll. Arg., *l.c.*

5. **P. Sangeana** Wain., sp. n.

Thallus epiphloecodes, tenuis, cinereus, sat lœvigatus, sat opacus, hypothallo nullo distincto. Apothecia verrucas 0·2 mm. latas, hemisphaericas, basi demum sat abruptas formantia, amphithecio thallino thallo concolore parte inferiore obducta, vertice demum late denudato et cæruleonigrante, convexo. Peritheciun pallidum, vertice cæruleonigrante. Nucleus jodo non reagens. Paraphyses simplices, septatae. Ascii oblongi, membrana tenui. Sporæ 8næ, distichæ, fusiformes, apicibus sat obtusis aut sat acutis, 5- ad 7-septatae, loculis demum sat æqualibus, decolores, strato gelatinoso nullo indutæ, long. 0·017 ad 0·022, crass. 0·006 ad 0·007 mm. Sporis crassioribus a *P. argillacea* Müll. Arg. differt.

GOLUNGO ALTO.—Ad corticem arboris Artocarpeæ, Musibiri dictæ (i.e. *Myrianthus arboreus*), prope Sange. No. 376 pr. p.

6. **P. argillacea** Müll. Arg., Lich. Afr. Occ. p. 42.

Ad corticem prope flumen Quillu leg. Pechuel-Loesche, teste Müll. Arg., *l.c.*

7. **P. (Sagedia) elæidis** Wain., sp. n.

Thallus tenuis, epiphloecodes, albido, sat lœvigatus, sat opacus, hypothallo nigricante partim limitatus. Gonidia chroolepoidea,

concatenata, cellulis parvis. Apothecia verrucas 0.25 mm. latae, depresso-hemisphaericas, nigras, nudas, vertice convexas, ostiolo parum prominente instructas formans. Perithecium fuscofuligineum, dimidiatum, basi deficiens. Paraphyses neque ramosae, nec connexae, sat numerose. Ascii cylindrico-clavati, long. circ. 0.060, crass. 0.010 mm. Spore 8nae, distichae, decolores, oblongae aut ovoideo-oblongae, 1-septatae, haud constrictae, septo fere in medio aut cellula angustiore paullo longiore, long. 0.014 ad 0.017, crass. 0.005 mm. *P. ruga* (Nyl., Exp. Pyrenoc. p. 55) Müll. Arg., Lich. Exot. p. 283, est affinis.

AMERIZ.—Ad corticem vetustum in trunco *Elodias guineensis*. No. 260 pr. p.

8. **P. (Phylloporina) epiphylla** Fée, Ess. Crypt. Ecore. Suppl. p. 76; Wain., Étud. Lich. Brés. II. p. 226.

Var. **præstans** (Nyl.) Wain., Lich. Antill. p. 35.

*Verrucaria præstans* Nyl., Lich. Angol. p. 15.

GOLUNGO ALTO.—Ad folia *Dracuna*. No. 238 pr. p. Ad folia *Celastri* (no. 269) et *Chailletia* in sylvis primevis in Serra de Alta Queta (no. 309 pr. p.).

Perithecium pallidum, KHO pulchre roseum. Spore 5—7-septatae. Thallus haud distincte gibberosus aut passim verruculis minutissimis parum distinctis inspersus.

9. **P. rufula** (Krempelh.) Wain., Étud. Lich. Brés. II. p. 227.

Var. **minuscula** Wain.

Apothecii minoribus a var. *rubicolore* (Stirt.) Wain. differt. Perithecium dimidiatum, rufescens, basi albidum, 0.2 ad 0.14 mm. latum, inferne sensim dilatatum acutatumque, in parte rufescente gonia phycopeltidea, in thallum circa apothecium radiatim continuata continens. Spore long. 0.017 ad 0.020, crass. 0.003 mm., oblongae, 3-septatae.

GOLUNGO ALTO.—Ad folia semperfurentia *Chytranthi Manuui* locis sylvaticis umbrosis prope Fonte de Capopa. No. 319 pr. p.

### 9. STRIGULA Fr.

1. **Str. (sect. Ochrothaele) hypothelia** Nyl., Lich. Ang. p. 15.

Thallus plagulas circ. 5 ad 8 (ad 3) mm. latae formans, radiatim sulcatus sive laciniis fere usque ad ambitum confluentibus sulcoque separatis instructus, radiatim etiam costulatus undulatusve, ambitu crenatus sive breviter lobatus, crenis lobisve 0.7 ad 2 mm. latis, glaucescens, pilis destitutus. Apothecia verrucas 0.3 ad 0.5 mm. latae, late mastoideo-conicas, basin versus sensim dilatatas, strato thallino thallo concolore omnino obductas aut ostiolo leviter prominente demum nigricante minutissimo (circ. 0.050 mm. lato) instructas formantia. Perithecium pallidum, vertice fuscescenti-pallidum. Paraphyses neque ramosae, nec connexae. Ascii cylindrici aut cylindrico-clavati. Spore monostichae aut rariis distichae, fusiformes, rectae aut parciter oblique, 1-septatae, haud aut leviter constrictae, long. 0.013 ad 0.017, crass. 0.004 ad 0.005 mm., 8nae, cellulis fere aequae longis.

GOLUNGO ALTO.—Ad folia *Fici* in sylvis densissimis prope Fonte de Capopa (no. 271 pr. p.) et in sylva primitiva prope Quisuculo (no. 288 pr. p.).

2. **Str. (sect. *Melanothæle*) *astroidea* Wain., sp. n.**

Thallus plagulas 1.5 ad 3 mm. latas formans, tenuis, laciniatus, laciniis angustissimis (circ. 0.2 mm. latis), linearibus aut apicem versus angustatis aut irregularibus, discretis aut centro plus minusve late connatis (raro partim brevissimis crenæformibusque), planis levigatisque aut sulea una longitudinali instructis, glauco-vires, aut demum glaucescenti-albescens, pilis destitutus. Apothecia verrucas 0.25 mm. latas, late mastoideo-conicas, basin versus sensim dilatatas et strato thallino obductas, apice late nigricantes formantia. Peritheciun fuligineum, dimidiatum, basi deficiens. Paraphyses neque ramosæ, nec connexæ. Ascii ventricosi basinque versus incrassatae aut subcylindrici, long. circ. 0.040 ad 0.045, crass. 0.011 ad 0.012 mm. Sporæ 8næ, distichæ, decolores, fusiformes aut fusiformi-oblongæ aut parce ovoideo-oblongæ, apicibus acutiusculis aut obtusiusculis aut altero apice obtuso, long. 0.013 ad 0.016, crass. 0.004 ad 0.005 mm., 1-septatae, cellulis sat æqualibus aut altera paullo longiore. Pyenides frequenter quam apothecia, conceptaculo denudato, fuligineo, dimidiato, basi deficiente, circ. 0.130 mm. lato. Stylosporæ oblongæ aut ovoideo-oblongæ, apicibus obtusis aut rarius rotundatis, rectæ, 1-septatae, decolores, long. 0.013 ad 0.014, crass. 0.003 mm. Huc forsan pertinet *Str. elegans* var. *oxyloba* Müll. Arg., Lich. Usamb. p. 293, sine apotheciis (ut videtur) lecta (nomen etiam ineptum).

GOLUNGO ALTO.—Ad folia arborum prope flumen in Varsea de Bumba (no. 260 pr. p.) et prope cataractam fluminis Cuango in Sange (no. 276 pr. p.). Huc evidenter etiam pertinent specimina stylosporis solis lecta ad folia *Alchornea* prope Sange (no. 261 pr. p.), ad folia annua *Bombacis buonopozensis* prope Fonte de Capopa (nos. 293 pr. p., 294 pr. p.), ad folia *Zanthoxyli* in sylvis prope Mussengue (no. 307 pr. p.) in Golungo Alto, sicut etiam ad folia arboris Burseraceæ (quæ gummi elemi producit—i.e. *Canarium edule*) in sylvis editis ad Dalatando in Cazengo (no. 262).

3. **Str. angustissima** Wain., sp. n.

Thallus plagulas 2 ad 4 mm. latas formans, bene laciniatus, laciniis angustissimis (circ. 0.1 mm. latis), bene convexis, linearibus aut leviter irregularibus, bene discretis aut partim plus minusve confluentibus, at usque ad centrum distinctis et in jugum convexum continuatis, bene varieque ramosis, vulgo bene pilosis, haud suleatis, glaucescenti-albidis. Apothecia verrucas 0.25 mm. latas, mastoideo-conicas, basin versus sensim dilatatas et strato thallino obductas, apice late nigricantes formantia. Peritheciun fuligineum, dimidiatum, basi deficiens. Ascii cylindrici aut basin versus attenuati, long. 0.040 ad 0.045, crass. 0.008 ad 0.009 mm. Sporæ 8næ, distichæ, decolores, fusiformes, apicibus acutis aut altero apice rarius obtuso, long. 0.010 ad 0.011, crass. 0.0025 ad 0.005 mm., 1-septatae, cellulis æqualibus.

GOLUNGO ALTO.—Ad folia coriacea arbuscula in sylvis densis prope Alta Queta. No. 300 pr. p.

*Str. pulchellum* Müll. Arg. in memoriam revoat, at laciniis angustioribus et sporis minoribus distichisque et apothecis minoribus ab ea differt.

#### 4. *Str. Africana* Wain., sp. n.

Thallus plagulas 1 ad 5 mm. latas suborbicularia formans, ambitu subinteger aut leviter crenulatus, crassitudine medioris, virescens (aut iacte albicans), haud pilosus, vulgo levigatus aut rarius leviter rugosus, nitidus. Apothecia verrucos 0.3 ad 0.4 mm. latas, mastoideo-conicas, basin versus sensim dilatatas, strato thallino obductas, griseas vel griseo-obsecuratas formantia, ostiolo minuto, leviter prominente, fuligineo, denudato. Perithecium fusco-fuligineum, dimidiatum, basi deficiens. Ascii cylindrico-clavati aut cylindrico-ventricosi; metaplasma ascorum jodo rubescens (ceterum nucleus jodo non reagens). Paraphyses neque ramosae, nec connexae. Spore Sme, distichae, decolores, fusiformes aut rarius ovoideo-fusiformes aut ovoideo-oblongae, apicibus acutis aut rarius obtusiusculis aut altero apice obtuso, long. 0.015 ad 0.020, crass. 0.004 ad 0.006 mm., 1-septatae, septo in medio aut fere in medio, haud aut parum constrictae. Pyrenides (verisimiliter hue pertinentes in no. 263), conceptaculo fuligineo, denudato, eire. 0.1 mm. lato. Stylosporae fusiformes aut oblongae, apicibus acutiusculis aut obtusis, rectae, decolores, 1-septatae, long. 0.013 ad 0.016, crass. 0.003 ad 0.004 mm. Habitu similis *Str. eleganti*, at thallo minus variabili, integriore et sporis 1-septatis ab ea differens.

GOLUNGO ALTO.—Ad faciem superiorem foliorum prope Sange. No. 261 pr. p. Ad faciem superiorem foliorum *Leptonychia urophylla* in sylvis primitivis prope Capopa. No. 265. Ad faciem superiorem foliorum *Fic* in sylva virginea prope Quisuenlo. No. 288 pr. p.

#### 5. *Str. atrocarpa* Wain., sp. n.

Thallus plagulas 0.5 ad 3 mm. latas suborbicularia aut diformes formans, ambitu subinteger aut leviter crenulatus, sat tenuis, glaucoirescens, planus, haud pilosus, levigatus, sat opacus, hypothallo nullo distincto. Apothecia verrucos 0.3 ad 0.4 mm. latas, hemisphaericas aut mastoideo-hemisphaericas, atras, nudas formantia, ostiolo demum leviter prominente. Perithecium fuligineum, dimidiatum, basi deficiens. Paraphyses neque ramosae, nec connexae. Ascii cylindrici, long. 0.055, crass. 0.004 mm., membrana tenui. Spore Sme, monostichae, decolores, fusiformes aut ovoideo-fusiformes aut rarius oblongae aut ovoideo-oblongae, apicibus acutis aut rarius obtusis, long. 0.008 ad 0.009, crass. 0.002 ad 0.0035 mm., 1-septatae, septo in medio, haud constrictae. Conceptacula pycnoconidiorum hemisphaerica, atra, dimidiata, nuda, 0.120 ad 0.160 mm. lata (in eodem thallo cum apothecis). Pycnoconidia simplicia, fusiformia aut oblonga, long. 0.003 ad 0.005, crass. 0.0007 ad 0.002 mm. Affinis est *Str. complanata* (Fée) Müll. Arg., Pyr. Cub. p. 381 (Wain., Lich. Antill. p. 35).

at sporis vulgo fusiformibus et apotheciis totis atris nudisque ab ea differens.

GOLUNGO ALTO.—Ad faciem superiorem folii arboris Sapindaceae prope Fonte de Capopa. No. 304 pr. p. Ad faciem superiorem foliorum *Fici urceolaris* Welw. in sylva primitiva prope Quisuculo. No. 288 pr. p.

Species sequentes, verisimiliter sine apotheciis inexacte determinatae, a Müll. Arg. in Lich. Afr. Occ. (Linnaea 1880) p. 41 commemorantur: *Str. complanata* (Fée) Müll. Arg. var. *ciliata* (Mont.) Müll. Arg., Pyr. Fée n. p. 5, Lich. Beitr. (1890) n. 1570 (ad flumen Quillu: Pechuel-Loesche), *Str. elegans* (Fée) Müll. Arg. var. *genuina* Müll. Arg., Pyr. Féean. p. 5, var. *viridissima* (Fée) Müll. Arg., *l.c.*, var. *nematora* Müll. Arg., Pyr. Cub. p. 380, Lich. Beitr. n. 1566 (ad Chinchoxo: Soyaux), var. *Féei* (Mont.) Müll. Arg., Pyr. Cub. p. 380 (ad flumen Quillu: Pechuel-Loesche).

#### 10. ARTHOPYRENIA (Mass.) Wain.

1. **A. (Polymeridium) obtecta** Müll. Arg., Lich. Beitr. (1883) n. 638.

*Sugedia obtecta* Müll. Arg., Lich. Afr. Occ. (Linnaea 1880) p. 42. *Verrucaria tecta* Stizenb., Lich. Afr. p. 223.

Ad corticem arboris prope flumen Quillu leg. Pechuel-Loesche, teste Müll. Arg., *l.c.*

2. **A. (Acrocordia) recepta** Müll. Arg., Lich. Beitr. (1883) n. 631.

*Sagedia alboatra* Müll. Arg., Lich. Afr. Occ. (Linnaea 1880) p. 42. *Verrucaria alboatra* Nyl. var. *recepta* Stizenb., Lich. Afr. p. 223.

Ad corticem emortuum et semiputridum Palmarum prope flumen Quillu leg. Pechuel-Loesche, teste Müll. Arg., *l.c.*

#### 11. DIDYMELLA Sacc.

Hoc genus gonidiis carens ad fungos pertinet.

1. **D. Loandensis** Wain., sp. n.

Mycelium maculam albida formans, gonidiis destitutum. Apothecia verrucas hemisphaericas formantia, 0.3 ad 0.35 mm. lata, nigra. Peritheciun fuligineum, dimidiatum, hemisphaericum, basi deficiens, denudatum aut basi tenuissime velatum. Nucleus jodo non reagens. Paraphyses numerosae, ramoso-connexae. Ascii cylindrici. Sporae 8næ, distichæ, decolores, ovoideo-oblongæ, 1-septatae, septo fere in medio, haud constrictæ, strato gelatinoso nullo indutæ, long. 0.013 ad 0.020, crass. 0.0035 ad 0.005 mm. Sporis *Verrucaria subprostanti* Nyl., Exp. Pyrenoc. p. 56, Lich. Nov.-Gran. Prodr. p. 491 (Müll. Arg., Lich. Beitr. no. 633), congruit, at apotheciis minoribus et ascis distichis ab ea differt et habitu subsimilis *Didymella cinchonæ* (Ach.) Wain., Etud. Lich. Bres. II, p. 233. Ad fungos pertinet.

LOANDA (0 ad 1000 ped. s. m.).—Ad corticem arboris junioris prope Maianga do Rei. No. 451 pr. p.

#### 12. TOMASELLIA Mass.

1. **T. euphorbiæ** Wain., sp. n.

Mycelium maeula albida pallidave indicatum, gonidiis destitutum. Pseudostromata 2 ad 0.5 mm. lata, difformia, tenuia, ex

apotheciis crebre aggregatis separatisque et pro parte confluentibus formata. Perithecia fuscofuliginea, dimidiata, basi deficiens, hemisphaerica, latere leviter anguloso-dilatata. Nucleus ellipsoideo compressus, jodo non reagens. Paraphyses ramoso-connexae. Ascii ovoideo-ventricosi, long. circ. 0.035, crass. 0.015 mm. Spores sphaericae, polystichae, decolores, oblongae aut rarius ovoideo-oblongae, 1-septatae, septo in medio, haud constrictae. Ad fungos pertinet.

LOANDA (0 ad 1000 ped. s. m.).—Ad trunco vetustiores *Euphorbia* arborescentis (Quisoma—i.e. *E. candolibrum*) in collibus sabulosis prope Boa Vista. No. 189.

Genus *Tomasellia* Mass. (Flora 1856, p. 283) ad fungos relegandum est. Ejus typus est *T. arthonioides* Mass. (Hepp, Flecht. Eur. n. 896), que gonidiis est destituta. Diversa est *Pyrenula* (subg. *Melanothecia*) *arthonioides* (Eschw.) Wain. (Müll. Arg., Pyr., Cub. p. 396).

## LICHENES IMPERFECTI.

### *Lepraria xanthina* Wain., sp. n.

Habitu similis est *Lepraria chlorina* Ach. (Wain., Lich. Antill. p. 38), at hyphis tenuioribus leptodermaticis instructa. Thallus citrinus, farinosus, KHO solutionem luteam effundens, hyphis 0.001 aut rarius 0.002 mm. crassis. Gonidia cystoococoidea, diam. 0.012 ad 0.006 mm., membrana sat tenui. Huc etiam *Lepraria* in Wain. Lich. Antill. p. 37 commemorata pertinet. Forsan haec species a *Caliciis* est evoluta.

GOLUNGO ALTO.—Frequenter ad corticem *Ficorum* prope Bango et Cambondo. No. 447. Ad corticem *Acacia* prope Camilungo. No. 338 pr. p. Ad corticem arboris prope Puri-cacarambola. No. 448.

CONGO.—Ad corticem *Elaeis guineensis* prope Porta do Ambriz. No. 446.

# FUNGI.

BY ANNIE LORRAIN SMITH.

## I. PHALLOIDÆ.

1. **DICTYOPHORA** Desv. Journ. de Bot. ii. p. 92, 1809.

1. **D. phalloidea** Desv. *l.c.*

*Phallus tunicatus* Schlecht. Linn. vol. xxxi. p. 123 (1861).

GOLUNGO ALTO.—On damp soil in the dense woods of Serra de Alto Queta, during the rainy season ; April 1855. Evidently very rare. Specimens were observed only during the three years 1854-57. No. 121.

2. **KALCHBRENNERA** Berk. Gard. Chron. vol. v. p. 785, 1876.

1. **K. corallocephala** Kalchbr. Abh. Ber. Natur. Akad. d. Wiss. Budapest Bd. X. No. xvii. p. 21, 1880.

*Lysurus corallocephalus* Welw. & Curr. Trans. Linn. Soc. xxvi. 1870, p. 287. t. 17. f. 8.

PUNGO ANDONGO.—In plantations of *Zea Mays*, on a moist sandy-clay soil, in fine weather, without any thunder, after three days of frequent rain. A single specimen growing in the Praesidium ; 10 Dec. 1856. No. 119.

3. **CLATHRUS** Mich. Nova Plant. Gen. p. 214, 1729.

1. **C. angolensis** Ed. Fischer. Jahrb. des botan. Gartens und des botan. Museums zu Berlin, 1886, p. 70.

*Laternea angolensis* Welw. & Curr., *l.c.*, p. 286. t. 17. f. 7.

PUNGO ANDONGO.—On volcanic rocks covered with soil, within the Praesidium, near Catete. One specimen only, gathered in fine weather : 10 Dec. 1856. No. 120.

## II. NIDULARIACEÆ.

1. **CYATHUS** Hall Hist. Helvet. iii. p. 127.

1. **C. striatus** Hoffm. Veget. Crypt. 1790. p. 33. t. viii. f. 3.

PUNGO ANDONGO.—Sparsely on rotten wood in the primitive damp woods near the Praesidium ; Feb. 1857. No. 113. On fallen branches among rotten leaves in open neglected fields near Sansamanda, on the banks of the river Cuanza ; March 1857. No. 114.

## III. LYCOPERDACEÆ.

1. **PODAXON** Fr. Syst. Myc. iii. p. 62 (1829).

1. **P. loandensis** Welw. & Curr., *l.c.*, p. 288. t. 20. figs. 5, 6, 7.

LOANDA.—Frequent in sandy pastures near the sea in Penedo, towards Conceição ; March 1854. No. 115.

2. **P. mossamedensis** Welw. & Curr., *l.c.*, t. 17, f. 23, and t. 19, figs. 1, 2, 3.

MOSSAMEDES.—In sandy thickets on the banks of the river Maiombo Oct. 1859. No. 149.

LOANDA.—Frequent in meadows and sandy maritime pastures near Penedo, and in Praia de Zamba Grande, near Loanda; Dec. 1853 and Feb. 1858. No. 149<sup>a</sup>.

3. **P. elatus** Welw. & Curr., *l.c.*, t. 19, figs. 4, 5, 6.

HUILLA.—Very sparse in sandy mixed woods (*i.e.* of *Proto*, *Myrtaceæ*, *Strychnos*, *Combretum*, *Acacia*, *Casuarina*, etc.) between Lopollo and Monino; Jan. 1860. No. 148.

2. **SPHÆRICEPS** Welw. & Curr., *l.c.*, p. 290.

1. **S. lignipes** Welw. & Curr., *l.c.*, p. 290, t. 18, fig. 2.

MOSSAMEDES.—In sandy thickets, composed chiefly of *Tamarix*, on the banks of the river Caroea, near Cabo Negro, about 16° S. lat., about 12 miles from the sea; Sept. 1859. No. 150.

3. **TYLOSTOMA** Pers. *Syn. Meth. Fung.* p. 139 (1801).

1. **T. angolense** Welw. & Curr., *l.c.*, t. 20, figs. 10, 11.

MOSSAMEDES.—Very rare. On sandy hills covered with *Euphorbia bellidifolia* Hiern, to the south of Mossamedes; July 1859. No. 147.

4. **GEASTER** Mich. *Nova Plant. Gen.* p. 220, 1729.

1. **G. mirabilis** Mont. *Ann. Sci. Nat. ser. 4, vol. iii.* p. 139, t. 6, fig. 8.

GOLUNGO ALTO.—Rare and sparse in the shady primitive woods of Serra de Alto Queta at a place called Casengue, on fallen leaves and bark, also on rotten trunks; Aug. 1856. On rotten trunks in the primitive woods of Quisneula and near Casengue; April 1856. No. 107.

2. **G. fimbriatus** Fr. *Syst. Myc.* iii. p. 16 (1829).

PUNGO ANDONGO.—Rare, on the ground near the river Casalalé in the Praesidium; Dec. 1856. No. 108.

5. **LYCOPERDON** Tourn. *Inst. Rei Herb.* p. 563 (1700).

1. **L. bicolor** Welw. & Curr., *l.c.*, p. 290, t. 20, fig. 12.

HUILLA.—In very damp woody pastures between Lopollo and Empalanea; May 1860. No. 146.

2. **L. cæspitosum** Welw. & Curr., *l.c.*, p. 289, t. 20, figs. 1, 2.

HUILLA.—Gregarious in upland poor meadows of Morro de Lopollo; April 1860. No. 145.

3. **L. golungense** Welw. & Curr., *l.c.*, t. 20, fig. 13.

GOLUNGO ALTO.—At the base of decayed trunks in the elevated woods of the mountain Cungulungulo; Feb. 1855. No. 118.

4. **L. asperimum** Welw. & Curr., *l.c.*, t. 20, figs. 3, 4, 14.

MOSSAMEDES.—In sandy thickets on the margin of Lagoa de Giraúl in a brackish place; July 1859. No. 142. In sandy meadows near Maiombo, on the banks of the river; Oct. 1859. No. 144. Currey says, *l.c.*, "No. 144 seems to be the same species, but exhibits no spines on the peridium." Though evidently an older specimen than No. 142,

there are still traces of spines, and the spores and capillitium are identical in form, size, and colour.

5. **L. Curreyi** Mass. in Trans. Journ. R. Micros. Soc. June 1887. p. 12.

*L. radicum* Welw. & Curr., *l.c.*, t. 20, figs. 8, 9. *L. Welwitschii* De Toni in Sacc. Syll. Fung. vii. p. 127 (1888).

LOANDA.—Very rare. In grassy places amongst thickets near Penedo ; March 1854. No. 116.

6. **L. Welwitschii** Mass., *l.c.*, p. 25.

*L. tomentosum* Welw. & Curr., *l.c.*, p. 288. t. 19. figs. 7, 8.

GOLUNGO ALTO.—On damp ground amongst rotten leaves in the primitive woods of Quisucula, near Bango ; Feb. 1855. No. 117.

#### IV. AGARICINEÆ.

1. **AGARICUS** Dill. Linn. Gen. Plant. gen. 1074. p. 492 (1754).

1. **A. (Omphalia) centenarius** Berk. & Curt. Ann. Nat. Hist. Ser. ii. vol. xii. p. 420, 1853.

GOLUNGO ALTO.—Growing abundantly on rotten trunks in woods of Mussungue ; May 1856. No. 297.

2. **PLEUROTUS** Fr. Syst. Myc. I. p. 178 (1821).

1. **P. semisupinus** B. & Br. Journ. Linn. Soc. xi. p. 529, 1871.

GOLUNGO ALTO.—On bark of decaying trunks of trees in Cungulungulo ; Feb. 1855. No. 342.

3. **LENTINUS** Fr. Syst. Orb. Veg. I. p. 77 (1825).

1. **L. umbrinus** Reichardt Novara-Exped. Bot. p. 143. pl. xxii. fig. 3, 1870.

CAZENGO.—On old trunks of trees in the elevated woods of Muxaúla ; June 1855. No. 348.

4. **LENZITES** Fr. Epicr. p. 403 (1836-38).

1. **L. repanda** Fr. Epicr. p. 404.

GOLUNGO ALTO.—On dead trunks in woods of Mussengue ; May 1855. No. 469. Frequent on old trunks beside rivulets near Sange and Bango. No. 468.

BUMBO.—Rather rare in woods of "Mutuate," *Copaiba Mopane* O.K. between Bumbo and Brubo ; June 1869. No. 488.

5. **SCHIZOPHYLLUM** Fr. Obs. Myc. I. p. 103 (1815)

1. **S. commune** Fr., *l.c.*

MOSSAMEDES.—On dead trunks in the woods near the mouth of the river Bero, and at Cavalheiros ; July 1859. No. 351.

HUILA.—On dead trunks close to the huts of the negroes near Humpata ; May 1860. No. 352. In woods of Panda (*Brachystegia*) near lake Ivantâla ; Feb. 1860. No. 352b.

GOLUNGO ALTO.—In the elevated primitive woods on the mountains of Alto Queta on dead trunks of *Pterocarpus tinctorius* and *Melia* "Bombolo" ; May 1856. No. 353.

## V. POLYPOREÆ.

1. **POLYPORUS** Mich. Nova Plant. Gen., gen. 129, 1729.

1. **P. brumalis** Fr. Syst. Myc. I. p. 318 (1821).

GOLUNGO ALTO.—On rotten trunks in the primitive woods of Quisucula near Bango-Aquitamba ; Aug. 1857. No. 251.

PUNGO ANDONGO.—On rotten trunks of *Phoenix reclinata* on the island Calemba, near Quisonde ; March 1857. No. 253. In sandy woods between Condo and Quisonde near the river Cuanza ; March 1857. No. 253.

2. **P. gilvus** Schwein. Fung. Carolin. No. 897, in Leipzig Schr. Nat. Gesell. I. p. 96, 1822.

HUILLA.—On trunks of almost dead *Leguminosæ* in woods of Panda (*Brachystegia*) near the lake of the Hippopotami (Ivantâla) ; Feb. 1860. No. 377.

GOLUNGO ALTO.—On prostrate small trunks of Moreira (*Chlorophora excelsa*) near Sobato Bango ; Sept. 1856. No. 391.

PUNGO ANDONGO.—On branches of trees in the woods near Quitage ; March 1857. No. 392.

3. **P. scapus** Fr. Epier. p. 473 (1836-38).

PUNGO ANDONGO.—On old rotting trunks near Condo, at the great cataract of the river Cuanza ; March 1857. No. 390.

1. **P. noctilucens** Lagerh. Ueber. ein. neu. phosph. *Polyporus* in Bol. da Soc. Brot. 1889, pp. 178-80.

PUNGO ANDONGO.—In light clear woods near Condo and Candumba ; March 1857. No. 385. Remarkably phosphorescent at night.

2. **FOMES** Fr. Nov. Sym. p. 47 (1851).

1. **F. lucidus** Fr., *l.c.*, p. 61.

PUNGO ANDONGO.—March 1857. No. 247. In woods composed of *Mimosa* and *Brachystegia tumarindoides* Welw. vel aff. (Muzamba), on sandy soil into which the stalk of the fungus had penetrated deeply, between Condo and Quisonde ; March 1857. No. 257.

2. **F. ignarius** Fr. Syst. Myc. I. p. 375 (1821).

SIERRA LEONE.—On old trunks in Sugar-loaf Mountains, rare ; Sept. 1853. No. 386.

3. **POLYSTICTUS** Fr. Nov. Sym., p. 70 (1851).

1. **P. xanthopus** Fr., *l.c.*, p. 74.

GOLUNGO ALTO.—On decaying trunks in Mata de Quisucula : Dec. 1855. No. 238.

PUNGO ANDONGO.—Very rare. On decaying trunks of *Phoenix reclinata* on the great island of the river Cuanza called Calemba between Condo and Quisonde ; March 1857. No. 239.

2. **P. affinis** Fr., *l.c.*, p. 74.

GOLUNGO ALTO.—Very rare. On old trunks of *Melia*, "Bombole," in the elevated woods of M. de Queta ; June 1856. No. 249.

3. **P. sanguineus** Fr., *l.c.*, p. 74.

GOLUNGO ALTO.—On fallen branches of the tree Mangue do Monte

(*Corynanthe*), in the mountains of Alto Queta or Luinha : July 1856. No. 366. Not infrequently on semi-barked wood in all the forests, but not everywhere, Queta Occident. ; May 1856. No. 365.

CAZENGO.—Rather rare on old trunks in dense woods ; Dec. 1854. No. 364.

PUNGO ANDONGO.—Frequent on rotten dry trunks chiefly on the monuments of negroes near Condo and Pedras de Guinga, etc., also on the pit-roofs of elephant hunters near N-popo on the Cuanza ; Feb. 1857. No. 367.

HUILLA.—Frequent on trunks of *Cesalpinia* in woods near Ivantâla ; Feb. 1860. No. 363.

4. **P. funalis** Fr., *l.c.*, p. 78.

GOLUNGO ALTO.—On rotten trunks of leafy trees (*Tecophilaeae*) close to the river near Sange ; March 1855. No. 383.

PUNGO ANDONGO.—On the trunks of trees referred to the *Spondiaceæ* near the great cataract of the river Cuanza behind Condo ; March 1857. No. 382.

5. **P. floridanus** Fr., *l.c.*, p. 81.

BUMBO.—Frequent on decayed trunks of various trees in the shady woods of Serra de Xella ; June 1860. No. 470.

6. **P. hirsutus** Fr., *l.c.*, p. 86.

GOLUNGO ALTO.—On decayed trunks of *Pseudospondias* (Mussondo) in woods near Camilungo ; March 1856. No. 472.

7. **P. zeylanicus** Cooke Grev. vol. xiv. p. 85, 1886.

GOLUNGO ALTO.—On decayed trunks near the river Delamboa ; Feb. 1856. No. 482.

8. **P. Peradenyæ** Cooke, *l.c.*, p. 84.

GOLUNGO ALTO.—On fallen branches in the shade at Cungulungulo ; May 1856. No. 476.

9. **P. occidentalis** Fr. Nov. Sym., p. 90 (1851).

GOLUNGO ALTO.—On dead branches in dense woods, M. de Queta : July 1856. No. 379. On rotten trunks in elevated woods, Luinha ; July 1856. No. 380. On old trunks in the woods of Mussengue ; May 1855. No. 494. On old trunks of *Melia*, "Bombo," between Cabondo and Sange ; Oct. 1854. No. 381. On *Khaya anthotheca* C.DC. in the woods of Sobato de Mussengue : Jan. 1856. No. 395. On bark of "Tacula" (*Pterocarpus tinctorius* Welw.), Senzala de Loanga ; Dec. 1855. No. 495. On old trunks of *Celtis Henriquesii* (Sponia) in woods near Quibolo ; April 1856. No. 396.

PUNGO ANDONGO.—Frequent on old trunks in forests near Bumba and Condo ; March 1857. No. 393.

HUILLA.—On dead fences near Lopollo ; Jan. 1860. No. 374.

AMBACA.—On old trunks of *Bauhinia* ; Aug. 1856. No. 493.

10. **P. lienoides** Fr., *l.c.*, p. 92.

PUNGO ANDONGO.—On old trunks in *Mimosa* forests near Condo ; March 1857. No. 389.

This species belongs to the *Fomes* group, as the pores are stratose in the older specimens, according to Montagne's description.

4. **PORIA** Fr. Nov. Sym., p. 70 (1851).

1. **P. vulgaris** Cooke Grev. vol. xiv. p. 109, 1886.

GOLUNGO ALTO.—On rotten trunks in forests of Alto Queta : May 1856. No. 398. On fallen branches in dense woods near Camilungo June 1857. No. 399.

5. **HEXAGONIA** Fr. Epier, p. 496 (1836-38).

1. **H. sinensis** Fr. Nov. Sym. Myc. p. 100 (1851).

PUNGO ANDONGO.—Rather rare, on beams on the tombs of negroes near Quibinda, growing with *Hexagonia Welwitschii* A. L. Sm. ; March 1857. No. 497.

HUILLA.—In the woods of Ivantala ; Feb. 1860. No. 372b.

2. **H. erinigera** Fr. Rel. Afzel. Fung. Guin. No. 23. t. iv. f. 10 (1860).

LIBOLO (AMBRIZ?)—On rotten trunks of trees in the country of Libolo between the river Dande and the river Loje or Ambriz : specimen gathered in haste by the way : Oct. 1858. No. 498.

3. **H. variegata** Berk. Proc. Amer. Acad. Arts & Sci. vol. iv. p. 122, 1862.

CAZENGO.—On decayed branches of shrubs (*Dalhousia*) in woods near Dalatando ; June 1855. No. 387.

4. **H. polygramma** Mont. Cuba, p. 379. t. 14. f. 3 (1838-42).

GOLUNGO ALTO.—On dead branches of various trees in the dense woods of Sobato de Mussengue : June 1856. No. 359.

PUNGO ANDONGO.—On dry branches of shrubs in Mata de Quilanga ; Feb. 1857. No. 361. On fallen branches of *Monodora angolensis* Welw. in Barranco of S. Antonio ; May 1857. No. 360.

HUILLA.—On old dead trunks in woods of *Leguminosa* (Panda) near the great lake Ivantala ; Feb. 1860. No. 362.

5. **H. Thollonis** Pat. & Hariot, Bull. Soc. Myc. vol. ix. p. 208, 1893.

HUILLA.—On fallen rotten branches in woods of Panda (*Brachystegia*, &c.) near lake Ivantala ; Feb. 1860. No. 372.

6. **H. Welwitschii** A. L. Sm. Journ. Bot. vol. xxxvi. p. 177 (May 1898).

PUNGO ANDONGO.—On rotten trunks on the sepulchres of negro chiefs in woods between Condo and Quisondo ; March 1857. No. 370.

A second specimen was gathered in Angola, but is without date, number, or locality.

7. **H. Stuhlmanni** P. Henn. in Engl. & Prantl die nat. Pflanzenfam. Lief. 172. p. 184 (1898).

HUILLA.—No. 520.

6. **DÆDALIA** Pers. Syn. Meth. Fung. p. 499 (1801).

1. **D. quercina** Pers., L.c., p. 500.

BUMBO.—On old trunks in woods of Serra de Xella, rather rare : June 1860. No. 486.

7. **FAVOLUS** Fr. Orb. Veg. i. p. 76 (1825).

1. **F. tessellatus** Mont. Ann. Sci. Nat. Ser. 2. vol. xx. p. 365, 1843.

GOLUNGO ALTO.—On old rotten trunks in the dense forests of Sobato de Cabanga Cacalungo : Jan. 1855. No. 254.

The fungus was white when gathered, but has become yellow in drying.

2. **F. brasiliensis** Fr. El. i. p. 44 (1828).

GOLUNGO ALTO.—On old trunks of palms (*Elavis guineensis*) in the elevated primitive woods of Sobato de Quilombo Quiacatubia ; Feb. 1855. No. 255.

3. **F. Rhipidium** Berk. in Hook. Journ. vol. vi. p. 319, 1847.

PUNGO ANDONGO.—Very rare on rotten wood in the elevated woods of Pedra de S. Antonio : Dec. 1856. No. 229.

8. **LASCHIA** Fr. in Linnaea v. p. 533, 1830.1. **L. lamellosa** Pat. Bull. Soc. Myc. 1888, p. 37, pl. xi. fig. 4.

PUNGO ANDONGO.—On rotten trunks almost entirely decayed in the dense humid woods of Mutolo near Pedras de Guinga ; Jan. 1857. No. 343.

## VI. HYDNEÆ.

1. **IRPEX** Fr. Syst. Orb. Veg. i. p. 81 (1825).1. **I. flavus** Kl. in Linn. viii. p. 488, 1833.

GOLUNGO ALTO.—On half-rotten branches in the primitive woods at the river Luinha ; July 1856. No. 477.

HUILLA.—Frequent on small trunks and dead branches in crowded woods near the lake Ivantâla ; Feb. 1860. No. 489.

The specimens are reflexed and dimidiate; when gathered dirty-white above and bright sulphur-colour below.

## VII. THELEPHOREÆ.

1. **STEREUM** Pers. Obs. Myc. I. p. 35. emend. Fr. Epicr. p. 545.1. **S. Ravenelii** Berk. & Curt. Grev. vol. i. p. 162, 1873.

HUILLA.—Growing in groups in moist pastures chiefly on dead *Eriocaulon*, near Lopollo ; Jan. 1860. No. 425. On dead grasses and other plants in dry thickets near Monino ; April 1860. No. 427.

2. **S. nitidulum** Berk. Not. Fung. Braz. Hook. Lond. Journ. ii. p. 10, 1843.

PUNGO ANDONGO.—Growing in groups among a rigid *Lycopodium* on volcanic rocks of Pungo Andongo ; Nov. No. 426.

3. **S. vespilloneum** Berk. Linn. Soc. Journ. vol. xvi. p. 44, 1878.

GOLUNGO ALTO.—On fallen branches, Alto Queta : March 1855. No. 431.

4. **S. versicolor** Fr. Epicr. p. 547 (1836-38).

GOLUNGO ALTO.—On fallen branches in the primitive dense mountainous woods of Alto Queta ; April 1856. No. 430.

5. **S. spadiceum** Fr. l.c., p. 549.

GOLUNGO ALTO.—On decayed wood in the forests of Mussengue ; May 1855. No. 437.

6. **S. lobatum** Fr. l.c., p. 547.

HUILLA.—On rotten trunks in woods near lake Ivantâla ; Feb. 1860. No. 428.

7. **S. perlatum** Berk. Enum. Fungi Cuming. no. 26 in Hook. Journ. p. 153, 1842.

CAZENGO.—On old trunks near the river in the elevated regions (*Regio Coffeana*) of the mountain of Muxaúlo : Dec. 1854. No. 429

2. **HYMENOCHAETE** Lév. Ann. Sci. Nat. Ser. 3, vol. v. p. 150, 1846.

1. **H. rubiginosa** Lév., *l.c.*, p. 151.

GOLUNGO ALTO.—Somewhat rare, on hard decayed wood, *Gardnus*, *Joris-tonantès* (N-day), Alto Queta, Carengue : July 1857. No. 440. Somewhat rare on dead branches in the elevated regions of the mountains of Sobato de Bumba ; June 1856. No. 439.

2. **H. fuliginosa** Lév. Ann. Sci. Nat. Ser. 3, vol. v. p. 152, 1846.

CAZENGO.—Somewhat rare, on the petioles of palm leaves (*Elaeocarpus*) near Trombeta ; Oct. 1851. No. 450.

3. **H. olivacea** Cooke in Grey, vol. xiv. 1885, p. 11.

GOLUNGO ALTO.—On decayed trunks in woods near Trombeta. Aug. 1857. No. 448.

3. **PENIOPHORA** Cooke in Grey, viii. p. 20, 1880.

1. **P. papyrina** Cooke in Grey., *l.c.*, t. 124.

GOLUNGO ALTO.—On old trunks of fig-trees near Trombeta : Sept. 1857. No. 435. Effused on the larger rotten branches in the forests of Alto Queta ; Aug. and Sept. 1855. No. 446.

HUILLA.—On rotten branches in forests consisting of Panda, near Ivantala ; Feb. 1860. No. 433.

2. **P. albo-marginata** Mass. Journ. Linn. Soc. vol. 25, p. 144, 1890.

GOLUNGO ALTO.—On decayed wood near the river Delamboa ; Jan. 1856. No. 445.

### VIII. CLAVARIEÆ.

1. **CLAVARIA** Vaill. Bot. Parisien. p. 39, pl. 7, f. 4, 1727.

1. **C. fastigiata** Linn. Flora Suec. no. 1269, p. 457, 1755.

HUILLA.—In grassy pastures among thickets surrounding the elevated woods up to 5600 ft. in the Monino highland : not frequent ; April 1860. No. 421.

2. **LACHNOCLADIUM** Lév. in Orb. Diet. viii. p. 487 (1846).

1. **L. furellatum** Lév. Ann. Sci. Nat. Ser. 3, vol. v. 1846, p. 159.

GOLUNGO ALTO.—Very rare ; at the base of trunks or among leaves in moist woods of Central Queta ; May 1856. No. 424.

### IX. TREMELLINEÆ.

1. **HIRNEOLA** Fr. Syst. Orb. Veg. p. 93 (1825).

1. **H. polytricha** Sacc. Syll. Fung. vol. vi. p. 766 (1888).

GOLUNGO ALTO.—On fallen dry branches in the primitive woods of Mata de Quibanga ; specimens few ; June 1856. No. 453. Also April 1856. No. 459.

ZENZA DO GOLUNGO.—On dead branches (*Rubiaceæ*) in woods on the left bank of the river Chixe : Sept. 1857. No. 460.

PUNGO ANDONGO.—On partially decayed dry branches in Mata de Pungo ; May 1857. No. 457. On slender rotten trunks, Mata de Pungo ; Feb. 1857. No. 458. On the bark of dead shrubs, Mata de Pungo : Dec. 1856. No. 456.

## X. USTILAGINÆ.

1. **USTILAGO** Fr. Syst. Myc. iii. p. 517 (1829).

1. **U. Cesatii** Fisch. de Waldh. Aperçu Syst. des Ustil. 1877, p. 25.

HUILLA.—In the flowers of *Cymbopogon Humboldtii* Spr., Welw. herb. 7512, in damp meadows between Monino and lake Ivantâla ; March 1860 (*ante*, p. 159).

PUNGO ANDONGO.—In the flowers of *Cymbopogon Humboldtii*, Jan. 1857, Herb. Welw. 2758. In the flowers of *C. filipendulus* Rendle, May 1857, Herb. Welw. 2773. In the flowers of *Heteropogon hirtus*, March 1857, Herb. Welw. 2806.

2. **UROCYSTIS** Rabenh. in Klotzsch Herb. Myc. ed. ii. no. 393.

1. **U. Colchici** Rabenh. Fung. Eur. no. 396 (1861).

AMBRIZ.—Frequent on the leaves of *Sansevieria angolensis* Welw. near Mubanga ; Nov. 1853. No. 10.

## XI. UREDINEÆ.

1. **UROMYCES** Link in Berl. Mag. vii. p. 28, 1816.

1. **U. Albucæ** Kalch. & Cooke Grev. xi. p. 20, 1883.

*U. Alliorum* Welw. & Curr., *l.c.*, p. 295.

PUNGO ANDONGO.—On the leaves and stalks of *Albuca monophylla* ; May 1857. No. 22.

2. **U. purpureus** Lagerh. Ustil. Ured. Welw. in Bol. da Soc. Brot. 1889, p. 128.

PUNGO ANDONGO.—On the leaves of *Anthericum pterocaulon* (*ante*, p. 52) in damp meadows near Muta Lucala ; March 1857. No. 19.

3. **Puccinia (vel Uromyces ?) Dorsteniæ** Lagerh., *l.c.*, p. 131.

PUNGO ANDONGO.—On the leaves of *Dorstenia Psilurus* Welw. in the primitive woods of Mata de Pungo near the village ; Feb. 1857. No. 184.

2. **ÆCIDIUM** Pers. in Linn. Syst. Nat. vol. ii. p. 1472, 1791.

1. **Æ. Euphorbiæ** Pers. in Linn., *l.c.*, p. 1473.

HUILLA.—On leaves of *Euphorbia macra* in somewhat dry bushy and rocky pastures near Lopollo ; March 1860. No. 128<sup>a</sup>.

2. **Æ. cissigenum** Welw. Herb.

*Æcidium* sp. Welw. & Curr., Trans. Linn. Soc. vol. xxvi. 1870, p. 293.

PUNGO ANDONGO.—On the leaves of *Cissus* sp. near Caghuy ; Nov. 1856. No. 105.

3. **Æ. benguellense** Lagerh., *l.c.*, p. 134.

HUILLA.—On leaves of *Fudogia fuchsoides* Welw. in the woods near the great lake of Ivantâla ; Jan. and Feb. 1860. No. 127.

4. **Æ. Welwitschii** Lagerh., *l.c.*, p. 131.

HUILLA.—On the leaves of *Rogenia pallens* Thunb. among the rocks of Morro de Monino : rare, April 1860. No. 128.

5. **Æ. Diospyri** A. L. Sm., *Journ. Bot.* vol. 36, p. 178, May 1898.

GOLUNGO ALTO.—On the leaves of *Diospyros mespiliformis* Hochst. (Musolveira) near Trombeta : March 1855. No. 208.

3. **UREDO** Pers. in *Usteri Ann. d. Bot.* p. 16, 1795.1. **U. africana** Lagerh., *l.c.*, p. 135.

HUILLA.—Frequent on the leaves of *Fadogia Cienkowskii* Schweinf. in the damp meadows between the river Ema and lake Ivantala : April 1860. No. 130.

## XII. SPHERIOIDEE.

1. **PHYLLOSTICTA** Pers. in *Fr. Syst. Myc.* ii. p. 527 (1823).1. **P. Strychni** Allesch. in *Engl. Pflanzenw. Ostafr.* C. p. 35 (1895).

AMBRIZ.—On the leaves of an arborescent *Strychnos* : Nov. 1853. No. 172.

2. **P. Tricalysiæ** A. L. Sm., *Journ. Bot.* vol. 36, p. 178, May 1898.

PUNGO ANDONGO.—On the upper side of the perennial leaves of one of the shrubby *Rubiaceæ* (*Tricalysia griseiflora* K. Schum.) at the back of the Präsidium, Mata de Pungo ; Nov. 1856. No. 6.

2. **PHOMA** Fr. *Syst. Myc.* ii. 546 (1823).1. **P. confuens** Welw. & Curr., *l.c.*, p. 285.

GOLUNGO ALTO.—On the leaves of a climbing shrub (*Leguminosa*) with white panicled flowers. Central Alto Queta : Aug. 1856. No. 63.

3. **ASCOCHYTA** Lib. Exs. p. minore parte em. Sacc. in *Nuovo Giorno Bot. Ital.* vii. p. 302, 1875.1. **A. Tiliacoræ** A. L. Sm., *l.c.*

GOLUNGO ALTO.—On leaves of a climbing Menispermaceous plant, *Tiliacora chrysobotrys* Welw. (Abutua) in the woods of Alto Queta : Dec. 1855. No. 4.

2. **A. Spondiacearum** A. L. Sm., *l.c.*

GOLUNGO ALTO.—On leaves of *Spondias Mombin* L. at Mata de Quisuculo : Feb. 1856. No. 173.

4. **SEPTORIA** Fr. *Syst. Myc.* iii. p. 480 (1829).1. **S. crustacea** Welw. & Curr., *l.c.*, p. 286.

GOLUNGO ALTO.—On the leaves of *Treculia africana* Decaisne, Welw. Herb. 2587. Trombeta : Oct. 1856. No. 73.

5. **CRYPTOSPORIUM** Kunze *Myc. Heft.* 1, p. 1, em. Corda in *Sturm Fl. Kr.* iii. *Heft.* 9, p. 105 (1829).1. **C. circinans** Welw. & Curr., *l.c.*, p. 286.

LOANDA.—Frequent on the leaves of a spiny shrub, *Cupressus corymbosa* Lam. var. *subglabra* Oliv., growing in thickets in cultivated fields, Loanda : between the country house (Museque) of Sr. Schut and Penedo : Jan. 1854. No. 64.

6. **PESTALOZZIA** De Not. *Torino Mem. Acad.* iii. p. 80, 1841.

1. **P. depazeoides** Welw. & Curr., *l.c.*, p. 284.

PUNGO ANDONGO.—Rare, on the leaves of *Ficus barbata* Warb. on the ridges of the rocks of the Præsidium (Pedra de Cazella) : Dec. 1856. No. 17.

### XIII. PYRENOMYCETES.

1. **EUROTIUM** Link, in *Linn. Spec. Plant.* VI. i. p. 79.

1. **E. herbariorum** Link., *l.c.*

GOLUNGO ALTO.—On the leaves of a climbing shrub (*Apocynaceæ* ?) in the primitive woods near Sange : Feb. 1855. No. 152.

2. **ASTERINA** Lév. *Ann. Sci. Nat. Ser. 3. vol. iii.* p. 59, 1845.

1. **A. difformis** Welw. & Curr., *l.c.*, p. 284.

PUNGO ANDONGO.—On the living leaves of *Trielisia Welwitschii* in the primitive wood “Mata do Pungo” ; Dec. 1856. No. 39.

3. **MELIOLA** Fr. *Elench. Fung.* ii. p. 109 (1828).

1. **M. formosa** Welw. & Curr., *l.c.*, p. 284. t. 17. figs. 1, 2, 3.

GOLUNGO ALTO.—On the leaves of *Spondias Mombin* Linn. in the forest near Quibolo ; Aug. 1856. No. 40.

4. **BOMBARDIA** Fr. *Summ. Veg. Scand.* p. 389 (1846).

1. **B. fasciculata** Fr., *l.c.*

*Sphoria Bombarda* Batsch. Welw. & Curr., *l.c.*, p. 283.

GOLUNGO ALTO.—On rotten wood in the primitive forests of Quisucula near Bango ; April 1856. No. 95.

5. **XYLARIA** Hill *Hist. Plants*, pp. 62 and 63, 1751.

1. **X. variabilis** Welw. & Curr., *l.c.*, p. 280. t. 17. fig. 7.

GOLUNGO ALTO.—Sparse on fallen rotten trunks in the primitive woods of Quisucula near Bango ; Feb. 1855. No. 104.

2. **X. axillaris** Welw. & Curr., *l.c.*, p. 279. t. 17. fig. 24.

GOLUNGO ALTO.—In the axils of branches of trees of *Bosqueia angolensis* near the banks of the river Cuango ; May 1855. No. 79.

3. **X. arenicola** Welw. & Curr., *l.c.*, p. 280. t. 17. figs. 5 and 6.

PUNGO ANDONGO.—In moist sandy places between Pungo Andongo and Cazella, rare ; Jan. 1857. No. 92.

4. **X. aphrodisiaca** Welw. & Curr., *l.c.*, p. 280. t. 18. figs. 3 and 4.

GOLUNGO ALTO.—On rotten trunks in the dense primitive woods not far from the river Delamboa ; Jan. 1856. No. 102.

5. **X. Hypoxylon** Grev. *Flora Edin.* p. 355 (1824).

GOLUNGO ALTO.—On rotting branches half immersed in the soil in shady woods on the right bank of the river Delamboa : Dec. 1855. No. 91. Specimen imperfect and rather doubtful. On old rotten trunks in the primitive woods near Sange and near Caverna de Salitre (salt-petre), Sobado de Mussengue ; May 1855. No. 87.

CAZENGO.—Densely caespitose on dead trunks in the primitive woods of the mountains of Muxaúla ; June 1855. No. 88.

AMBACA.—On old trunks in the elevated woods near Puri-Cacarambola ; Oct. 1856. No. 90.

BUMBO.—In dense array in very damp, dense, primitive woods near Bumbo ; Oct. 1859. No. 135.

6. **X. digitata** Grey. *Flor. Edin.* p. 355 (1824).

BUMBO.—On large rotting trunks in the dense damp woods of Sierra de Xella, about 3000 ft. high ; Oct. 1859. Nos. 136 and 136<sup>b</sup>, the latter on *Nannea*.

7. **X. scopiformis** Mont. *Ann. Sci. Nat. Ser. 2.* vol. xiii. 1840, p. 349.

GOLUNGO ALTO.—On old rotten trunks in the woods of Quilonibio-Quiacatubia, in one place only, but frequent there : Feb. 1855. No. 89. This species has been recorded by Currey, *l.c.*, p. 283, as *Hypoxyylon scopiforme* Mont.

8. **X. hippotrichoides** Sacc. *Syll. Fung.* vol. i. p. 344 (1882).

GOLUNGO ALTO.—On branches near Cabanga rather rare, also on standing branchlets of *Asparagus*, etc., in Alto Queta and near Sange : Feb. 1855. No. 5.

6. **PORONIA** Willd. *Flor. Berol. Prodri.* p. 400, 1787.

1. **P. claviformis** Welw. and Curr., *l.c.*, p. 281.

PUNGO ANDONGO.—On rotten wood in caves of the rocks, Arimo do Salgado, rare ; Dec. 1856. No. 85. Spores unknown. A second specimen evidently the same but also without ascospores, on tufts of burnt grass near Cazella ; Jan. 1857. No. 462.

7. **HYPOXYLON** Bull. Champ. de Fr. I. p. 168, 1791.

1. **H. annulatum** Mont. *Ann. Sci. Nat.* 1855, Ser. 4, vol. iii. p. 117. *Var. depresso* Welw. & Curr., *l.c.*, p. 283.

AMBACA.—On old rotten trunks of trees near Cabinda ; Oct. 1856. No. 69. On rotten trunks in the elevated woods near Puri-Cacarambola ; Oct. 1856. No. 83. On old rotten trunks in woods near the great cavern of Puri-Cacarambola ; Oct. 1856. No. 84. This specimen is imperfect and somewhat doubtful.

2. **H. rubiginosum** Fr. *Summ. Veg. Scand.* p. 384 (1846).

GOLUNGO ALTO.—On dead fallen branches in the woods of Serra de Alto Queta ; March 1855. Nos. 82 and 82<sup>b</sup>.

3. **H. serpens** Fr. *l.c.*

GOLUNGO ALTO.—Frequent on the bark of decayed branches of various trees near Banca de Mussengue ; July 1855. No. 81.

8. **KRETSCHMARIA** Fr. *Summ. Veg. Scand.* p. 409 (1846).

1. **K. aggregata** Sacc. *Syll. Fung. Add. ad vol. i.* p. xxix, (1883). *Hypoxyylon aggregatum* Welw. & Curr., *l.c.*, p. 282, tab. 17, fig. 22.

GOLUNGO ALTO.—On rotten trunks near Terras de Bumba covering almost the whole trunk of a large tree ; May 1855. No. 94. On examining the plant I find a number of scattered spores in the perithecia ; they are dark-brown, curved, tapering toward the ends and measure 25 to 27  $\mu$  by 10  $\mu$ . A second specimen collected in Angola is without date, locality or number.

2. **K. angolensis** Sacc., *l.c.*

*Hypoxyylon angolense* Welw. & Curr., *l.c.*, p. 282 tab. 17, fig. 19.

GOLUNGO ALTO.—On rotten trunks of *Bombax buonopozense* P. Beauv. (*Mafumeira branca*) near Quibolo; March 1856. Nos. 103 and 524.

3. **K. cetrariooides** Sacc., *l.c.*

*Hypoxylon cetrariooides* Welw. & Curr., *l.c.*, p. 282. tab. 18, fig. 5.

GOLUNGO ALTO.—On the bark of rotten trees in the primitive woods near Quibolo; April 1856. No. 80. In the woods of Queta. No. 523.

PUNGO ANDONGO.—On rotten trunks of large trees in the primitive woods near Quilanga; April 1857. No. 97. The spores measure 30 by 10  $\mu$ .

9. **DALDINIA** Ces. & de Not. Comm. Critt. Ital. I. 197 (1863).

1. **D. concentrica** Ces. & de Not., *l.c.*, p. 198.

*Hypoxylon ustulatum* Bull. Welw. & Curr., *l.c.*, p. 282.

GOLUNGO ALTO.—On dead trunks of trees (*Spondias*) near Ponte do Felix Simoes: Nov. 1854. Nos. 101 and 522. On trunks of *Sterculiaceae* in the woods of Muria; Sept. 1857. No. 525.

PUNGO ANDONGO.—In the primitive woods near Quilanga; Jan. 1857. No. 99. A very doubtful specimen.

10. **NUMMULARIA** Tul. Sel. Fung. Carp. ii. p. 42 (1863).

1. **N. Bulliardii** Tul., *l.c.*, p. 43.

*Hypoxylon nummularium* Bull. Welw. & Curr. *l.c.*, p. 282.

GOLUNGO ALTO.—On dead standing branches in the woods of Serra de Alto Queta; Dec. 1855. No. 93. Frequent in all secondary woods, Capopa. On trunks of *Argyrodendron* (*Croton*); June 1856. No. 98.

2. **N. suborbicularis** Sacc. Syll. Fung. vol. i. p. 399 (1882).

*Hypoxylon suborbiculare*, Welw. & Curr. *l.c.*, p. 281. tab. 17, fig. 18.

HUILLA.—In the woods between Monino and lake Ivantala on half dead trunks; March 1860. No. 137.

11. **PHYSALOSPORA** Niessl. Verhandl. d. Nat. Ver. in Brünn., vol. xiv. p. 170, 1875.

1. **P. Labecula** Sacc. Syll. Fung. I. p. 447 (1882).

The above species differs slightly from that described by Leveillé, in having the spores arranged in the ascus in two oblique rows. The ascus is somewhat ovate-oblong, 70 by 15  $\mu$ ; the spores measure 12 to 15 by 5  $\mu$ .

CAZENGO.—On the leaves of *Acacia Sieberiana* DC. near Cacula; June 1855. No. 228.

12. **TRICHOSPHÆRIA** Fekl. Symb. Myc. p. 144 (1869).

1. **T. acanthostroma** Sacc. Syll. Fung. I. p. 454 (1882).

GOLUNGO ALTO.—On old trunks of a species of *Vitex* near Camilungo; June 1855. No. 42. On decayed trunks in the woods of Queta Oriental; June 1856. No. 444. On rotten trunks near Trombeta; Aug. 1857. No. 452. A very imperfect specimen.

AMBACA.—Frequent on the bark of old trees near Cabinda, especially on *Spondias*; Oct. 1856. No. 46. There is a very small specimen without date or locality. No. 46b.

13. **PHYLLOLACHORA** Nits. in Fekl. Symb. Myc. p. 216 (1869).

1. **P. repens** Sacc. Syll. Fung. vol. ii. p. 597 (1883).

*Sphaeria lanaris* Welw. & Curr., *l.c.*, p. 283.

GOLUNGO ALTO.—On leaves of various species of *Ficus* near Cangunho : Nov. 1854. No. 74. Also near Sange, July 1855. Frequent on old leaves of *Ficus* (cf. Herb. Welw. 6387 and 6411) Quibige : Dec. 1855. No. 76. On the living leaves of *Ficus* rather rare, Sange : May 1855. No. 75

HUILLA.—*Isothea rhytidoma* Fr. Welw. & Curr. *l.c.* p. 285. On leaves of *Ficus trachyphyllus* Fenzl. in woods at Monino : May 1860. No. 141. Also near Lopollo, Feb. 1860. Herb. Welw. 6971. See Journ. Bot.

2. **P. irregularis** A. L. Sm. Journ. Bot. vol. xxxvi. p. 179. May 1898.

*Isothea irregularis* Welw. & Curr. *l.c.* p. 285.

GOLUNGO ALTO.—On the leaves of a species of *Ficus* (cf. Herb. Welw. 6335), Alto Queta ; March 1856. No. 2

3. **P. minutissima** A. L. Sm., *l.c.*

*Isothea minutissima* Welw. & Curr. *l.c.* p. 285.

GOLUNGO ALTO.—On the leaves of a species of *Pennisetum* (Marianga) near Cangunho (Rio Cate) : Sept. 1855. No. 31.

13. **DOTHIDELLA** Speg. Annales de la Soc. Cien. Argent., vol. 12, p. 185, 1881.

1. **D. Welwitschii** A. L. Sm., *l.c.*

MOSSAMEDES.—On the leaves of *Tundia Batimii* Hook. f., near Cabo Negro ; Sept. 1859. No. 206.

2. **D. Graphis** A. L. Sm., *l.c.*

LOANDA.—On the branches of a shrub without leaves or flowers near Maianga do Povo : March 1854. No. 507.

14. **MICROTHYRIUM** Desm. Ann. Sci. Nat. Ser. 2, vol. xv. p. 137, 1841.

1. **M. Millettiae** A. L. Sm., *l.c.*

GOLUNGO ALTO.—On leaves of *Millettia Griffoniana* Baill., on the Serra de Alto Queta towards the river Luinha ; July 1856. No. 223.

15. **SEYNESIA** Sacc. Syll. Fung. vol. ii. p. 668 (1883).

1. **S. nobilis** Sacc., *l.c.*

*Pemphidium nobile* Welw. & Curr. *l.c.* p. 283, tab. 17 f. 12.

GOLUNGO ALTO.—On the petioles of the leaves of a palm, *Elois guineensis*, near the river of Capopa : June 1856. No. 60.

#### XIV. HYPHOMYCETES.

1. **HAPLOTRICHUM** Link in Linn. Spec. Pl. vi. i. p. 52 (1821).

1. **H. capitatum** Link, *l.c.*

PUNGO ANDONGO.—Rare, on the leaves of a species of *Gymnosporia* Sobato Cabanga ; Jan. 1857. No. 48

There is no *Haplotrichum* left on this specimen, the leaf is covered with a gall-like formation.

2. **PENICILLIUM** Link in Berl. Ges. Nat. Freunde Mag. iii. p. 16, 1809.

1. **P. glaucum** Link, *l.c.* p. 17.

LOANDA.—Frequent, forming a grey pellicle on the surface of ink in the rainy season : Nov. 1857. No. 38.

3. **HELMINTHOSPORIUM** Pers. Myc. Eur. i. p. 17, 1822.1. **H. Cordiae** Welw. & Curr., *l.c.*, p. 292. t. 17. figs. 9 to 11.GOLUNGO ALTO.—On the leaves of *Cordia chrysocarpa* Bak. in the primitive woods near Sange ; March 1856. No. 1.4. **STILBUM** Tode Fung. Meckl. i. p. 10, 1790.1. **S. sericeum** Welw. & Curr., *l.c.*, p. 291.GOLUNGO ALTO.—Rare, on the bark of a leguminous tree, *Albizia fistigia* Oliv. in the forests of Alto Queta ; Jan. 1856. No. 49.2. **S. cæspitosum** Welw. & Curr., *l.c.*GOLUNGO ALTO.—On old trunks of *Ficus* during the rainy season near Canguerasange : Nov. 1854. No. 50. On decayed trunks of *Ficus* in moist woods, Sobato de Quibombo Quiacatubia, etc. ; Feb. and May 1855. No. 50b.HUILA.—On the bark of *Ficus*, very frequent during the rainy season near Lopollo towards Monino ; Feb. 1860. No. 131.5. **GRAPHIUM** Corda Ic. Fung. I. p. 18 (1837).1. **G. aterrimum** Sacc. Syll. Fung. vol. iv. p. 611 (1886).*Stilbum aterrimum* Welw. & Curr., *l.c.*, p. 291.GOLUNGO ALTO.—On the cortex of decayed trees of the genus *Ficus*, in the woods of Quibanga ; April 1855. No. 52.6. **TUBERCULARIA** Tode Fung. Meckl. I. p. 18 (1790).1. **T. garantica** Speg. Fung. Guar. i. Anal. Soc. Cien. Arg. 1884. p. 126.GOLUNGO ALTO.—On the bark of rotten trunks of *Ficus*, Sange ; April 1855. No. 175.7. **HYMENULA** Fr. Syst. Myc. ii. p. 233 (1823).1. **H. vulgaris** Fr., *l.c.*, p. 234.PUNGO ANDONGO.—On the follicles of *Strophanthus* near the bridge at Luxillo ; Jan. 1857. No. 20.8. **EXOSPORIUM** Link in Berl. Ges. Nat. Freunde Mag. iii. p. 9, 1809.1. **E. celatum** A. L. Sm. Journ. Bot. vol. xxxvi. p. 179. May 1898.*Sporidesmium celatum* Welw. & Curr., *l.c.*, p. 292. tab. 17. fig. 15.GOLUNGO ALTO.—On the leaves of *Croton Dracunopsis* in the thicket behind Rodrigo's Cubata ; Oct. 1855. No. 77.

## XV. SCLEROTIACEÆ.

1. **SCLEROTIUM** Tode Fung. Meckl. I. p. 2 (1790).1. **S. stipitatum** Berk. & Curr. in Trans. Linn. Soc. vol. xxiii. pp. 91, 93.

HUILA.—On the roots of dead trees concealed under 1 to 3 ft. of soil in cultivated potato fields near Lopollo ; April and May 1861. No. 138.

2. **S. flavidum** Welw. & Curr., *l.c.*, p. 292.

PRINCE'S ISLAND.—On the ground among decaying turf on sparingly grassy slopes 800 to 1000 ft. high in a moist place at the opening of the primitive forest ; Sept. 1853. No. 27.

# MYCETOZOA.

DETERMINED BY ARTHUR LISTER, F.R.S.

1. **STEMONITIS** Gleditsch Meth. Fung. p. 140, tab. iv., 1753.

1. **S. splendens** Rost. Mon. p. 195.

GOLUNGO ALTO.—On dead stems and on living leaves of *Musa sapientum* near the river Luinha; gathered during an excursion with the distinguished Sr. Pereira, Jan. 1855. No. 109.

2. **S. herbarica** Peck in Rep. N. York Mus. xxvi. p. 75, 1874.

GOLUNGO ALTO.—On living leaves of a species of *Jussiaea* near the river Quiapozé; Dec. 1855. No. 112.

2. **COMATRICHIA** Preuss in Linnaea xxiv. p. 140, 1851.

1. **C. longa** Peck in Rep. N. York Mus. xlvi. p. 24, 1890.

GOLUNGO ALTO.—On rotten wood in the primitive woods of Quisueula near Bangó. Aug. 1857. No. 110. On fallen bark in the damp woods of Serra de Alto Queta; Dec. 1855. No. 111.

3. **ARCYRIA** Hill Nat. Hist. ii. p. 47, 1751.

1. **A. incarnata** Pers. Obs. Myc. I. p. 58 (1815).

GOLUNGO ALTO.—On the bark of trunks in the woods of Alto Queta; rare; July 1855. No. 122.



## ERRATA.

### VOL. I.

Page xiii, line 30, *for* 3000 *or* 1000 *read* 300 *or* 100.  
 " xvii, last line but one, *for* 1871 *read* 1873.  
 " xix, line 27, *for* *Consulho* *read* *Conselho*.  
 " xx, " 19, *for* *de* *read* *do*.  
 " xxv, " 12 from bottom, *for* *Ortopteros* *read* *Orthopteros*.  
 " 3, lines 32 and 34, *for* *Agnas* *read* *Aguas*.  
 " 7, line 6, *for* *form* *on* *read* *forming*.  
 " 12, " 16, *after* *grandiflora* *insert* Oliv.  
 " 13, " 14 from bottom, *for* *Songa* *read* *Songo*.  
 " 15, " 14 from bottom, *for* " *Xib* " *read* " *Xile* ".  
 " 22, " 10, *for* **NYMPHÆA** Tournf. L. *read* **CASTALIA** Salisb. in  
     König & Sims, Ann. Bot. ii. p. 71 (1805).—*Nymphaea*  
     L. pro parte.  
 " " 11, *for* **N. Lotus** *read* **C. mystica** Salisb., *i.e.*, p. 73. — *Nymphaea*  
     *Lotus*.  
 " " 4 from bottom, *for* **N. malabarica** *read* **C. stellaris** Salisb.,  
     *i.e.*, p. 72. — *Nymphaea malabarica*.  
 " 24, " 11, *for* **NASTURTIUM** *read* **RORIPPA** Gesner ex Scop. Fl.  
     Carmiol. edit. 1, p. 520 (1760). — *Nasturtium*.  
 " " 12, *for* **N. officinale** *read* **R. Nasturtium** Beck Fl. Nied.  
     Oesterr. ii. 463 (1892) (*Roripa*). — *Nasturtium officinale*.  
 " " 24, *for* **N. indicum** *read* **R. indica**. — *Nasturtium indicum*.  
 " " 12 from bottom, *for* **N. humifusum** *read* **R. humifusa**. —  
     *Nasturtium humifusum*.  
 " 28, lines 10-8 from bottom, should read as follows:—  
     2. **PEDICELLARIA** Schrank in Roem. & Usteri Mag.  
     Bot. iii. pt. vii. p. 40 (1790).  
     *Gynandropsis* DC. Prodr. i. p. 237 (1824); Benth. &  
     Hook. f. Gen. Pl. i. p. 106.  
     1. **P. pentaphylla** Schrank, *i.e.*, p. 11.  
     *Gynandropsis pentaphylla* DC., *i.e.*, p. 238; Oliv. Fl.  
     Trop. Afr. i. p. 82.  
 " 36, line 10 from bottom, *for* *Cuanza* *read* *Cuango*.  
 " 37, " 2 from bottom, *for* *Cuanza* *read* *Cuango*.  
 " 39, " 17, *for* " *Fele* " *read* " *Xichi ofele* ".  
 " 40, " 1, *for* 28 *read* 128.  
 " 43, " 19 from bottom, *for* 3000 *read* 5000.  
 " 67, lines 6-2 from bottom should read as follows:—  
     6. **LASS** Adams, Fam. Pl. ii. p. 100 (1763).  
     *Malache* B. C. Vogel in Trew. Pl. Sel. Ehret. dec. viii.  
     p. 50, t. 90 (1772). *Paronia* Cav. Diss. iii. p. 132, tt. 45-47.  
     19 (1786); Benth. & Hook. f. Gen. Pl. i. p. 205.  
     1. **L. macrophyllum** O. Kuntze, Rev. Gen. Pl. III. II.  
     p. 20 (1898) (*Lassa macrophylla*).  
     *Paronia macrophylla* E. Mey. ex Harv. in Harv. &  
     Sond. Fl. Cap. i. p. 169 (1860); Mast. in Oliv. Fl. Trop.  
     Afr. i. p. 190 (1868). *Malache macrophylla* O. Kuntze  
     *i.e.*, p. 70 (1891).

Page 68, lines 6 and 7 should read as follows:—

2. **L. hirsutum.**

*Paxonia hirsuta* Guill. & Perr. Fl. Senegamb. i. p. 51 (1830); Mast. in Oliv. Fl. Trop. Afr. i. p. 191. *Malache hirsuta* O. Kuntze, Rev. Gen. Pl. i. p. 70 (1891).

.. 68, lines 12 and 13 should read as follows:—

3. **L. Schimperianum.**

*Paronia Schimperiana* Hochst. in Pl. Schimp. Abyss. ii. n. 1405 (1842); A. Rich. Fl. Abyss. i. p. 52 (1847); Mast. in Oliv. Fl. Trop. Afr. i. p. 192. *Malache Schimperiana* O. Kuntze, Rev. Gen. Pl. i. p. 72 (1891).

- .. 75, line 8, *for Congo* *read Cuango*.
- .. 83, .. 19, *after 1857* *insert No. 4693*.
- .. 84, .. 18, *for Cacabango* *read Caealungo*.
- .. 84, .. 22, *for Quilembo* *read Quilombo*.
- .. 85, .. 14 from bottom, *for following* *read flowering*.
- .. 120, .. 16 from bottom, *for Cuanza* *read Cnango*.
- .. 139, .. 13, *for D. retroversum* Hiern, sp. n. *read D. parvifolium* Engl. Bot. Jahrb. xxiii. p. 136 (15 Sept. 1896).
- .. 164, .. 7 from bottom, *for 1459* *read 1495*.
- .. 173, .. 14 from bottom, *for peduncle* *read petiole*.
- .. 182, .. 1 from bottom, *for Cazengne* *read Carengue*.
- .. 187, .. 13 from bottom, *for (1891)* *read (1892)*.
- .. 213, .. 23, *for dam* *read Lam.*
- .. 214, .. 6 from bottom, *for Lapostas* *read Lagostas*.
- .. 215, .. 2 from bottom, *for in*, *read ft.*
- .. 229, .. 14, *for Quisueolo* *read Quisuenlo*.
- .. 248, .. 27, *for 36* *read 86*.
- .. 250, .. 23, *for Canguerange* *read Canguerasange*.
- .. 262, .. 28, *for Perevia* *read Pereira*.
- .. 267, .. 21, *after minimus* *insert* Medik, l.c.
- .. 288, .. 19 from bottom, *for Cadumba* *read Candumba*.
- .. 291, .. 14 from bottom, *for Banga* *read Banza*.
- .. 296, .. 7, *for Candamba* *read Candumba*.
- .. 298, .. 14, *for 529* *read 529b*.
- .. 299, .. 21 from bottom, *for Zenzas* *read Zengas*.

.. 332, lines 12–15 should read as follows:—

1. **LAUREMBERGIA** Berg. Pl. Cap. pp. 350, 351 (Aug. 1767).

*Serpicula* L. Mant. Pl. p. 16 (Oct. 1767); Benth. & Hook. f. Gen. Pl. i. p. 675.

1. **L. repens** Berg., l.c.

*Serpicula repens* L., l.c., p. 124; Oliv. Fl. Trop. Afr. i. p. 405. *S. serpyllifolia* Burm. f. Prodr. Fl. Cap. p. 26 (1768).

Var. *brachypoda* (Welw. ms.).

- .. 366, line 2, *for Heteropteris* *read Heterotis*.
- .. 396, .. 24, *for three* *read four*.
- .. 465, .. 9 from bottom, *for 3* *read 4*.
- .. 498, .. 24, *for uniflora* *read uniflora*.
- .. 550, .. 15, and page 552, line 6 from bottom, *for (1896)* *read (1897)*.
- .. 556, .. 13 from bottom, *for Blume* *read Blumea*.
- .. 562, .. 26, p. 566, line 7 from bottom, and p. 569, line 5, *for (1896)* *read (1897)*.

.. 575, lines 6–12 should read as follows:—

42. **EUPATORIOPHALACRON** Adans. Fam. Pl. ii. p. 130 (1763).

*Eclipta* L. Mant. Pl. alt. p. 157. n. 1321 (1771); Benth. & Hook. f. Gen. Pl. ii. p. 361.

1. **E. album.**

*Verbesina alba* L. Sp. Pl. edit. 1, p. 902 (1753). U.

*prostrata* L., *Ic.* *Cotula alba* and *C. prostrata* L., *Syst. Nat.* ii, p. 564 (1767). *Eclipta creta*, *Ecl. prostrata*, and *Ecl. punctata* L. Mant. Pl. alt. p. 286 (1771). *Ecl. alba* Hassk. Pl. Jay. Bar. p. 528 (1848); O. & H. in Oliv. F. Trop. Afr. iii, p. 373. *Ecliptica alba* O. Kuntze, Rev. Gen. Pl. i, p. 334 (1891).

Page 575, line 15 from bottom, *for* (1896) *read* (1897).

" 576, lines 20-24, should read as follows:—

45. **NIEBUHRIA** Neck. Elem. Bot. n. p. 30 (1790) non Scop.

*Heredia* Jacq. Enum. Pl. Carib. p. 8 (1769); Benth. & Hook. f. Gen. Pl. ii, p. 370; non Lodd. (1758).

1. **N. africana**.

*Heredia africana* Pers. Syn. Pl. ii, p. 190 (1807); P. Beauv. Pl. Ow. ii, p. 19, t. 69 (1819); O. & H. in Oliv. F. Trop. Afr. iii, p. 376. *Serruncum africanum* O. Kuntze, Rev. Gen. Pl. i, p. 365 (1891).

" 576, line 9 from bottom, and

" 577, " 22, *for* **W. huillensis** *read* **N. huillensis**, and *for* **W. albiflora** *read* **N. albiflora**.

" 578, " 4, and

" 603, " 24, *for* (1896) *read* (1897).

" 696, " 24, *for* p. 693 *read* p. 309, n. 693.

" 717, " 16, *for* **C. procumbens** L. *read* **C. procumbens** L.

" " last line, *for* *Arthoenemum* *read* *Arthoenemum*.

" 764, line 31, *for* 11 *read* 12, and after following numbers to correspond.

" 810, " 23, *for* *Loranthus Buchneri* Engl. *read* *L. sessilifolius* P. Beauv.

" 824, lines 11-23, *for* **E. amplexicaule** S. Moore. (et seq.) *substitute* **E. Clarkei** Hiern, sp. n. (et seq., vide p. 1032).

" 837, line 16, *for* *Vites huillensis* Hiern, sp. n. *read* **V. grisea** Baker in Pl. Trop. Afr. v, 335 (1900).

" 853, " 15, *for* 5830 *read* 5530.

" 882, lines 21 and 22, *dele* from *In hot . . . to No. 5389 incl.*

" 1004, " 31-33, *dele* from *At the . . . to No. 6393 incl.*

## VOL. II.

Page 9, line 1, *for* *guyomanum* *read* *Guyonianum*.

" 9, " 3, *for* *guyomanus* *read* *Guyonianus*.

" 11, " 18, *after* No. 665 *insert* **PUNGO ANDONGO**.—, and begin a fresh line.

" 23, " 37, *after* No. 6441 *insert* **GOLUNGO ALTO**.—, and begin a fresh line.

" 24, lines 12-11. The district of No. 6448b should be **PUNGO ANDONGO**.

" 34, line 22, *after* *HEMANTHUS* *insert* *Linn.*:

" 38, " 7 from bottom, *before* 1012 *insert* **COLL. CARP.**

" 39, " 21 and 32, *after* No. 4036 *insert* partly.

" 46, between lines 14 and 15 *add* *A. arborescens* Welw. in *Bolet. Consell. Ultram.* May 1856, p. 251: non Miller.

" 53, line 6, *after* No. 3776 *insert* partly.

" 55, " 29, *add* *at end* No. 3793.

" 59, " 8, *for* No. 1049 *read* **COLL. CARP.** 1019.

" 66, lines 34-41. *Cancel* these lines, and *add* *after* No. 1626, on last line of p. 61, **COLL. CARP.** 1050.

" 66, bottom of page, No. 3014 is probably a *Nymphaea*.

" 79, line 8 from bottom, *for* **GOLUNGO ALTO** *read* **HUTILLA**.

" 81, " 17, *add* *at end* No. 6655.

" 85, " 6 from bottom, *after* No. 214 *add* **COLL. CARP.** 1022.

" 88, " 5 from bottom, *for* 1852 *read* 1857.

" 89, last line, *for* Sept. *read* Dec.

Page 92, line 8 from bottom *add W. Delilei* Welw. ex Trim., *l.c.*, non Schleid.  
" 93, " 13, *after No. 3010 add* COLL. CARP. 1023.  
" 99, " 4 from bottom, *for stellarioides read stellarioides*,  
" 105, " 11 from bottom, *dele* in.  
" 106, " 7 from bottom, *dele the whole line*.  
" 110, " 3 from bottom, *before On spongy insert HUILLA*.—  
" 122, last line, *prefix CAPE DE VERDE ISLANDS*.—  
" 132, " 33, *for E. abyssinica read E. abyssinica*.  
" 155, " 7, *for No. 1321 read* n. 1321.  
" 155, " 31, *for Cuanga read Cuango*.  
" 181, lines 1 and 2, *transfer so as to follow line 5*.  
" 187, line 36, *add at end No. 2930*.  
" 193, " 4 from bottom, *for heavy read hoary*.  
" 195, " 18, *dele* No. 7243.  
" 195, " 19, No. 7241 should be 7243.  
" 196, " 6, *for 7653 read 2653*.  
" 206, " 14, *for monspeliense read monspeliensis*.  
" 222, " 11 from bottom, *for 2902 read 2602*.  
" 229, " 15, *for abyssinicum read abyssinicus*.  
" 229, " 41, *for pusillum read pusillus*.  
" 230, " 19, *for benguellense read benguellensis*.  
" 237, " 15, *for HUILLA read PUNGO ANDONGO*.  
" 240, " 2 from bottom, *for 1894 read 1854*.

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E. RAY LANKESTER,  
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July 1st, 1900.

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